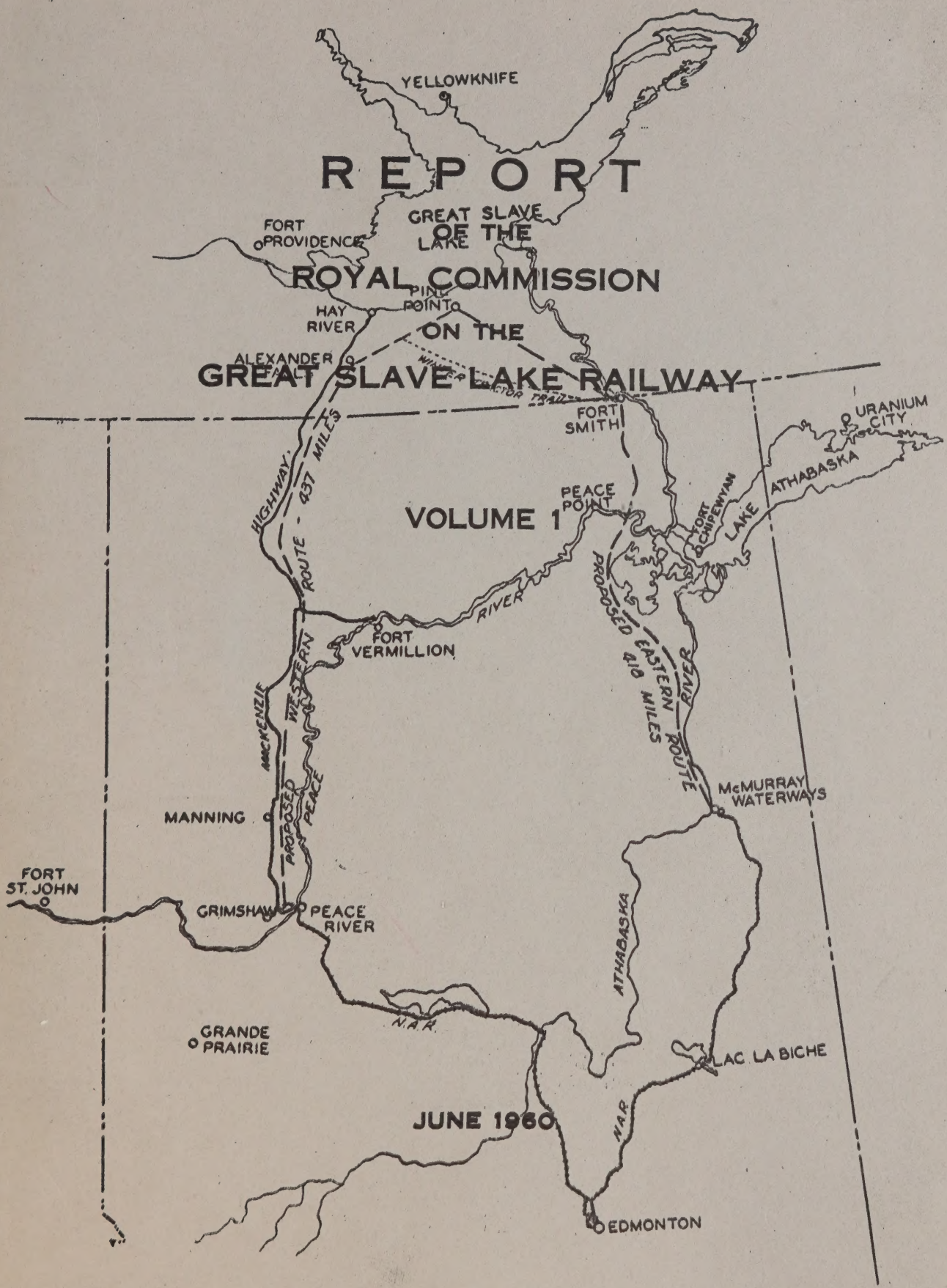
Canada. Royal commission on the Great Slave Lake Railway.

Report. v. 1-2, 1960.

REPORT OF THE ROYAL COMMISSION ON THE GREAT SLAVE LAKE RAILWAY

VOLUME 1



JUNE 1960

REPORT

OF THE

ROYAL COMMISSION

ON THE

GREAT SLAVE LAKE RAILWAY

VOLUME 1

INTRODUCTION

REPORTS OF COMMISSIONERS

VOLUME II

(to be printed July 1960)
Will contain factual and statistical material as follows:

PART 3 - FACTORS RELEVANT TO A CHOICE OF ROUTE

Chapter VI Agricultural Resources
Chapter VII Forestry Resources
Chapter VIII Mineral Resources
Chapter IX Harbours
Chapter X Population
Chapter XI Engineering Cost Factors
Chapter XII Traffic Factors

APPENDICES

A. Commission of Appointment and Order in Council P.C. 1959-705
B. Hearings of the Royal Commission - Places and Dates
C. List of Submissions and Witnesses.

JUNE 1960

ROYAL COMMISSION ON THE RAILWAY TO GREAT SLAVE LAKE

COMMISSIONERS

Mr. Justice M. E. Manning, Chairman

W. D. Gainer, B.Sc. M.S., Ph.D.

John Anderson-Thomson, B.Sc. D.L.S.

A. Paterson, C.A.
Secretary

F. L. Graham
Assistant Secretary

F. M. Feehan, B.A. L.L.B.
Counsel

Edmonton, June 30th, 1960.

TO HIS EXCELLENCY

THE GOVERNOR GENERAL IN COUNCIL:

MAY IT PLEASE YOUR EXCELLENCY,

We the Commissioners appointed as a Royal Commission in accordance with the terms of Order in Council P.C. 1959-705 of Fourth of June 1959, upon certain matters related to the railway to the Great Slave Lake,

BEG TO SUBMIT TO YOUR EXCELLENCY

THIS REPORT

Chairman

Member

Member

Secretary

I N D E X

INDEX - (Continued)

APPENDIX

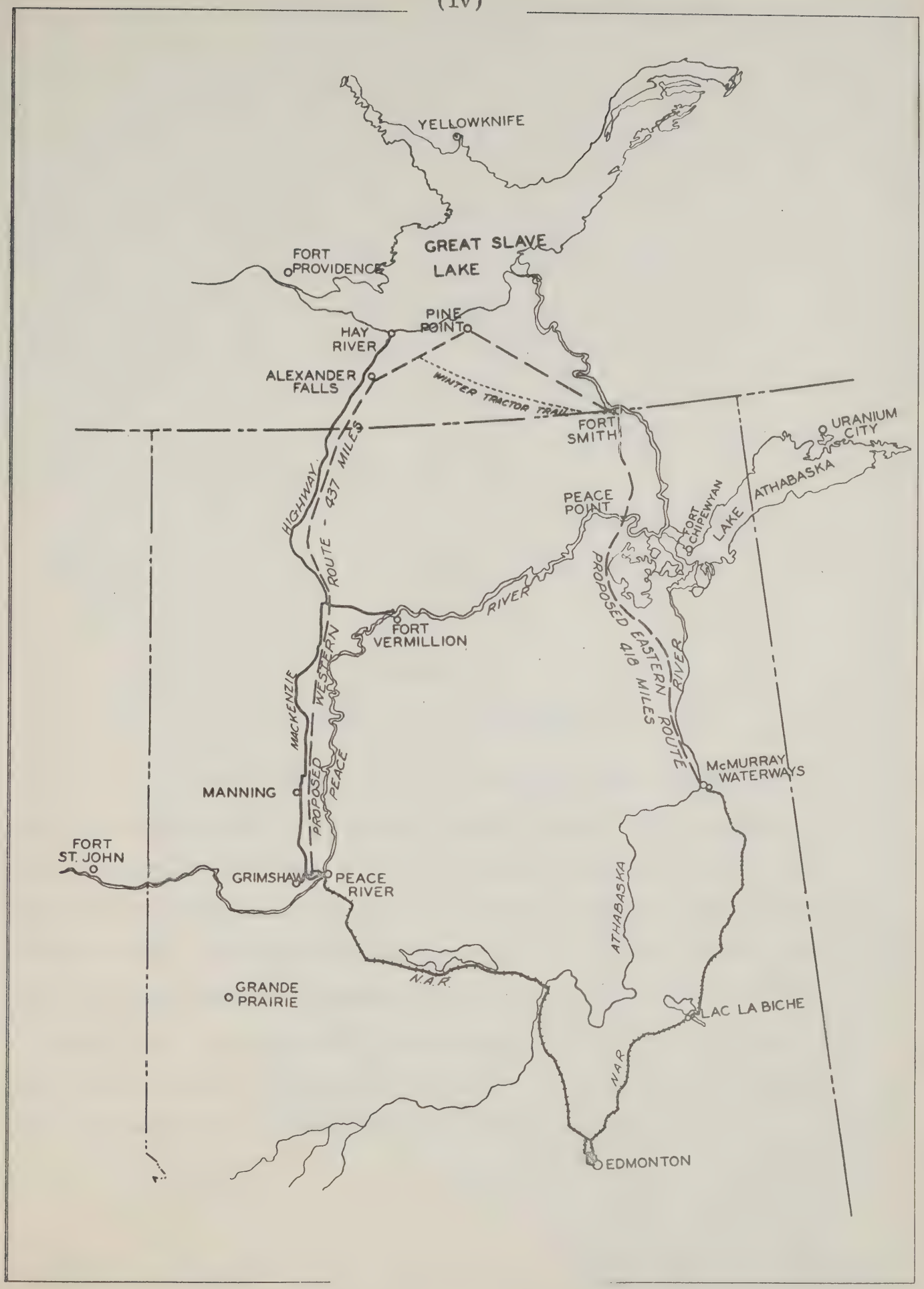
CHAPTER I

TERMS OF REFERENCE

This Commission was appointed by Order-in-Council dated 4th June 1959, which will be set out in full as Appendix A in Volume II.

The Commission was directed,

> "to inquire into and report upon the respective merits of the alternative routes which might be followed by a railway line to be built from northern Alberta into the southern portion of the District of Mackenzie, Northwest Territories, for the purpose of providing access to and contributing to the development of that portion of the Territories tributary to Great Slave Lake."


YELLOWKNIFE
GREAT SLAVE LAKE
FORT PROVIDENCE
PINE POINT
HAY RIVER
ALEXANDER FALLS
WINTER TRACTOR TRAIL
FORT SMITH
URANIUM CITY
ATHABASKA
LAKE
FORT CHIPEWYAN
PEACE POINT
HIGHWAY ROUTE - 437 MILES
PROPOSED EASTERN ROUTE 418 MILES
RIVER
FORT VERMILLION
MACKENZIE WESTERN
PROPOSED PEACE
MANNING
McMURRAY WATERWAYS
FORT ST. JOHN
GRIMSHAW
PEACE RIVER
ATHABASKA
N.A.R.
GRANDE PRAIRIE
LAC LA BICHE
N.A.R.
EDMONTON

CHAPTER II

SUMMARY BY THE CHAIRMAN

Each member of the Commission has arrived at conclusions somewhat different from the others and accordingly each has written his own report. For the convenience of those who wish to read our conclusions without having to read the whole of the report, we have agreed that I should set out at the beginning of this report, a summary of the conclusions of each of us. We hope that the inevitable weaknesses of a summary will not be forgotten, because it is an attempt to state in a few sentences the opinions that are explained in several pages.

There is little mention of the Pine Point property in the summaries; but we wish to make it clear that our conclusions are based on the assumption that the most important immediate reason for the railway to Great Slave Lake appears to be the transportation of lead zinc concentrates from Pine Point. The President of Pine Point Mines Limited has told us that it is of major importance to his company that the railway be built as soon as possible, but of "minor importance" which route it follows.

SUMMARY OF OPINIONS OF DR. GAINER.

Dr. Gainer favours an easterly route from Waterways terminating at Hay River and such as will serve the Pine Point and Fort Smith regions by short spur line connections.

A railway along the west route would result in a total annual saving to farmers north of Grimshaw of some $164,000 spread over something like 1000 farms at present; this railroad would be less costly to build and possibly less costly to operate than a railroad along the east route; but a railroad along the east route holds for the future prospects for greater traffic generation and for serving a larger addition to national product than is indicated along a west route. This is so because of the greater growth prospects apparent for the mining and related industries, for instance, than for certain other primary industries including agriculture. Such growth prospects are said to take account of both production and market potential for the industries of the region. Because of these greater growth prospects, and

because of a labour productivity in mining some two to three times greater than that in agriculture, the economic growth interests of the northern region here being considered will best be served in the future by locating a railroad to the east rather than to the west.

A railroad to the east will fit better into any future pattern of extended transportation services in the northwest reaching ultimately beyond Great Slave Lake along the Mackenzie valley and making additional connections with existing facilities to the south.

Dr. Gainer recognizes the substantial claims of the farming and forestry industries north of Grimshaw for lower cost transportation services because of distance from markets. But he is also of the opinion that to provide this assistance by locating a railroad to the west rather than to the east will involve a large sacrifice in the extent to which a railroad can serve directly in the development of even more remote northerly regions. The Commission's terms of reference state that a railway is to be built "for the purpose of providing access to and contributing to the development" of northern regions tributary to Great Slave Lake. In considering the routes from this point of view, Dr. Gainer thinks there is greater weight in the merits of the East route.

SUMMARY OF OPINIONS OF MR. ANDERSON-THOMSON.

Mr. Anderson-Thomson favors the West Route. He explains that the pioneers of the area north of Peace River have

hoped for years for a railway and that their hopes are based partly on statements made years ago by members of the Government of Canada that appear to promise a railway, and he emphasizes the large contribution to national greatness that has stemmed from the spirit of initiative and enterprise of men and women who have come from Canadian farms. He feels accordingly that a railway to the north should be built where it will give service and encouragement to agriculture.

He thinks that a railway along the West Route would develop more timber resources than a railway along the East route; that a railway along the West Route would provide competition to trucking along the Mackenzie Highway that will reduce freight charges for the north.

With regard to the East Route, he feels it would be more costly to build and to operate; that the area adjacent to the East Route is not encouraging for mining and that it is not desirable to build a railway for the mining industry until the mines are found for which the railway is designed.

SUMMARY OF OPINIONS OF THE CHAIRMAN.

On the basis of present knowledge, the case for the Eastern Route seems weaker than the case for the Western Route.

The Pine Point Mining Company has presented a strong case for the development of their property and argue that this would be warranted only if a railway is built. To the extent that this argument, advanced by the Pine Point Company, is material, we are

unable to see why the railway is necessary for the development of the mine. It appears to us that products of the mine could be taken over the Mackenzie Highway by truck at a very substantial profit.

In any event, the choice of route is not material to the Pine Point property; nor does it seem material with regard to mining operations north of the Lake.

The strongest argument in favor of the Eastern Route is the possibility of mining developments south of Great Slave Lake to which spur lines could be built from the railway. There appears no doubt that large mines may be found south of the Lake that will become a compelling argument in favor of a railway either along or somewhere near the proposed Eastern Route.

On the other hand, so far as can be anticipated now, a railway would appear to be just as useful for a great agricultural expansion in the millions of acres north of Grimshaw as for mineral development south of Great Slave Lake. That railway would also give service to communities already established.

If, because of the urgent desires of the Pine Point Mining Company, a railway is to be commenced at once, it seems that the West Route has advantages in that it will be cheaper to build the railway, it will be easier to carry building supplies to different parts of the railway via the Mackenzie Highway, and the exact location of the railway can be settled with relative ease. The East Route on the other hand, goes through country that is not well known and there are uncertainties with regard to cost of construction and location of the railway line.

CHAPTER III

REPORT OF THE CHAIRMAN

A. INTRODUCTION

We have been directed to "inquire into and report upon the respective merits of the alternative routes" for a railway from northern Alberta to the southern portion of the District of Mackenzie, Northwest Territories.

We have received a substantial number of briefs on the subject and held several days of public hearings, and we have made numerous private inquiries.

There has been a wide divergence of opinion as to the route which should be followed. Only two routes have been advocated publicly; the Western Route from Grimshaw to the south shore of Great Slave Lake, and the Eastern Route from Waterways to the south shore of Great Slave Lake.

It appears to me that the merits of a railway, whether along one route or the other, to the south shore of Great Slave Lake, are:

If the railway follows either route, it will assure the development of the great lead zinc ore body at Pine Point by Pine Point Mines Limited which owns this property and which is a subsidiary of The Consolidated Mining and Smelting Company of Canada Limited. It is proposed that a mill be built at Pine Point to produce over 200,000 tons of lead zinc concentrates per year which have been said to be valued at over $20,000,000, the concentrates to be shipped by rail to the large smelter of the Consolidated Mining & Smelting Company at Trail, B.C. for final treatment to produce the lead and zinc in the form of metals.

If the railway follows the west route it will provide railway service for agriculture in the populated area north of Grimshaw and it will be available for any agricultural expansion that may take place in several million acres of arable land north of present development.

If the railway follows the east route it should be of assistance to any mining development that takes place between Lake Athabasca and Great Slave Lake.

If the railway follows either route it will provide service for timber resources that might not be harvested without a railway.

If the railway follows either route it will serve as a beginning of a much longer railway that may later extend down the valley of the Mackenzie River or that may circle Great Slave Lake to any mines that may be found in the vast area between Great Slave Lake and the Arctic Ocean.

There is great optimism felt by many for the future of the North. Each group of advocates for their respective route feels that the railway will "open up the country" and promote early development of the type that is appropriate for that route. We subscribe to the view, as we believe all persons do who have studied the North, that the future is bright and great development is likely, although the exact nature of that development and the time and place for its occurrence may not now be clearly ascertainable.

In the enthusiasm for the prospects of one railway or the other, it is often emphasized that the railway will "open up the country". It seems to me that however bright the prospects are, in considering the merits of either one route or the other and what is hoped for as a result of building the railway, it should perhaps also be kept in mind that the construction of a railway does not <u>necessarily</u> lead to immediate or even early development of the area adjacent to the railway; for example, both

transcontinental railways pass through many miles of prospective mining and timber country in northern Ontario and both branches of the Northern Alberta Railway pass through parts of Alberta which have for many years remained undeveloped.

B. FACTORS THAT RELATE TO THE PROPOSED RAILWAY

PINE POINT MINE

One of the main reasons for building a railway is to assure the opening of a large mine. Our inquiries suggest, however, that a profitable mining operation may not be entirely dependent on a railway that makes normal freight charges for the product of the mine.

The Consolidated Mining and Smelting Company has established the presence of one of the world's largest base metal deposits at Pine Point. The evidence given to us indicates that over 200,000 tons of lead zinc concentrates can be taken from this property for at least 20 years and very possibly for a much longer period.

During our public hearings we were indebted to Mr. W. G. Jewitt, President of Pine Point Mines Limited and Vice-President of the Consolidated Mining and Smelting Company, for a brief, and for appearing before us to present the brief and to answer questions. At that time, Mr. Jewitt argued in favour of the East Route mainly on the assumption that it would be a shorter

route and that the freight charges on the concentrates from Pine Point would accordingly be less than the freight charges over the West route.

The members of the Commission had a subsequent meeting with Mr. Jewitt at which time he pointed out that it was, of course, his duty to his company to advocate the route that would provide the cheapest transportation but he then wished to emphasize that it was a matter of "minor importance" to his company which route the railway followed but of major importance that the railway be built as soon as possible.

Such urgency as there may be in the need for the railway raises important considerations. The Consolidated Mining and Smelting Company has for many years carried on a very large operation in their lead zinc mine at Kimberley, B.C. and at their smelter at Trail. These operations have attracted much attention in the mining industry and amongst people interested in mining though not directly associated with it, and it has been generally thought the Consolidated Mining and Smelting Company had such large reserves of ore in the Kimberley mine that it had no immediate desire to open the Pine Point Mine, although if the government would build a railway it would be willing to put the Pine Point property into operation to provide substantial revenues for the railway.

During our public hearings Mr. Jewitt said:

> "If a railroad were built to Great Slave Lake, and the freight rate were normal and reasonable, the company would plan to put its property into production at the rate of about 215,000 tons of concentrates per year."

When Mr. Jewitt saw us after our public hearings he told us that his reason for approaching us at that time was that senior officials of his company knew that it was generally thought that the Consolidated Mining and Smelting Company did not have need for Pine Point ore for many years and feared that this might be the occasion for delay in building the railway, whereas in fact the Company will soon be very desirous of concentrates from Pine Point. Mr. Jewitt indicated that if the railway is built (irrespective of which route it follows) his company will give assurances that it will start very soon to put the Pine Point property into operation; whereas if the railway were not to be built the property might not be developed for a long time.

Mr. Jewitt has pointed out that if the property is put into operation, the number of employees will be approximately 225 which would create a community of approximately 1000 people. The gross national income will be increased by some $20 million dollars annually, assuming the concentrates to be worth $100 per ton, and there may be a substantial saving of foreign exchange if the Pine Point concentrates will obviate the necessity of obtaining concentrates from outside Canada. There will also be revenue to the Dominion Government from income taxes and royalties from the production of the mine.

The desirability of this mine being put into operation has been known for years and the long delay appears to have given rise to a widespread impression that the mine could not operate without a railway and without "normal" freight rates for carrying concentrates to Trail. In view of this apparently

widespread opinion, with some emphasis on "normal" freight rates, we feel that we should bring the following matters to the attention of the Government.

There is now a gravel highway from Grimshaw to Hay River and without much difficulty a good highway could be extended to Pine Point. The concentrates from Pine Point could be brought out to Grimshaw by truck for from 4¢ to 4½¢ per ton mile, or a total of $17.20 to $19.35 per ton. One of the freight rates estimated by the railway companies for carrying concentrates was 1.25¢ per ton mile or $12.31 per ton from Grimshaw to Trail. It appears to us that the cost of producing a ton of concentrates at Pine Point should not exceed $40 and there is a good chance that the cost will be somewhat less. The total cost of delivering a ton of concentrates at the Trail smelter, without a railway, should therefore not exceed $71.66 as follows:

Cost of production	$40.00
Cost of trucking to Grimshaw	$19.35
Railway freight charges from Grimshaw to Trail	$12.31
	$71.66

Mr. Jewitt's estimate, during our public hearings, of the value of a ton of concentrates based on "smelter settlements" at Trail was $100 and this seems to be pretty much in accord with the public statements that are frequently made that the annual production from Pine Point (estimated at 215,000 tons) will exceed $20 million dollars. On the basis of these figures, the annual profit to the owners of the Pine Point mine would be

over $28 per ton for 215,000 tons or more than $6 million dollars, even without a railway being built.

If a railway is built and "normal" freight rates are charged for the concentrates, the profit would be much greater. On the basis of figures given to us ~~on~~ by the railway companies there would be an additional $2,500,000. It would appear that there would also be a large deficit for the railway.

We raised these questions with Mr. Jewitt when he emphasized his argument that the Government should build the railway and promise "normal" freight rates in order to assure the opening of the Pine Point mine. Mr. Jewitt then took the position that his original estimate of the value of concentrates at $100 per ton was perhaps high and that the average prices for lead and zinc through 1958 would have made a ton of concentrates worth $71.50. On the basis of trucking costs and 1958 prices, this would of course leave either no profit or a considerably smaller profit than suggested above.

AGRICULTURE

(a) A railway along the West Route would provide service to some 8,000 people who live north of Grimshaw, most of whom are engaged in farming.

(b) It would also be available to serve a possible large agricultural expansion if that should occur north of the present populated area.

(a) SERVICE TO PEOPLE NOW LIVING NORTH OF GRIMSHAW.

In the area north of Grimshaw there are approximately 8,000 people, most of whom are engaged in agriculture and most of whom would like to see a railroad built from Grimshaw north to Great Slave Lake. It appears to us that the amount of grain which is now grown in this area and which would be transported by railway is approximately 36,000 tons per year and that the average distance which this grain would travel to Grimshaw is 65 miles.

The town of Manning is 60 miles north of Grimshaw. More grain is grown in this district than in any other district north of Grimshaw. It costs 15¢ per bushel to ship this grain by truck to Grimshaw and a further 26¢ per bushel to ship it by railway to Vancouver, for a total shipping cost of 41¢ per bushel.

The Farmers' Union of Alberta presented a carefully prepared brief to us and explained that the farmers who live north of Grimshaw would expect that the Crow's Nest Pass freight rate schedule should apply if the railway is built, as they hope, from Grimshaw north. This would mean that the grain from Manning to Vancouver would travel at 28¢ a bushel which would provide substantial relief to the farmer who now pays 15¢ for trucking and 26¢ for railway freight.

If the Crow's Nest Pass freight arrangement is to be applied, it will mean an advantage to the farmers living north of Grimshaw but the grain will provide only a trivial revenue to the railway and this accounts for the estimate of the railway companies that their total revenue from carrying agricultural products would be only $15,000 per year.

There is another group of farmers living in the area of Fort Vermilion which is 250 miles by highway to Grimshaw and some 60 or 75 miles west of the proposed railway route. These farmers pay 50¢ per bushel to have their wheat trucked to Grimshaw. If the western railway is built they would still have to truck their wheat some 60 or 70 miles to reach the railway, and, even applying the Crow's Nest arrangement, they would then be no better off than the farmers are now who live 65 miles north of Grimshaw. It is the desire to provide railway service for these people engaged in agriculture north of Grimshaw which has been the basis of much of the strongest advocacy for the West Route.

It was argued before us that there would be considerable revenue to a railway along the West route from the shipment of livestock. But, much of the livestock from Northern Alberta, from places where there is a daily train service, now travels by truck. It is hardly likely that a new railway could provide daily service and could not expect to compete with trucks in carrying livestock.

We have been advised on reliable authority that truck traffic has improved to the point where it even competes with

railways in some places in carrying grain. A group of railways running into St. Paul, U.S.A. have recently applied for permission to reduce freight rates on grain to compete with trucks. In British Columbia trucks are now carrying substantial quantities of grain from the area around Creston for distances of 250 to 300 miles in direct competition with railways. Accordingly it seems all the less likely that a railway north of Grimshaw would carry much livestock.

(b) POSSIBLE AGRICULTURAL EXPANSION.

There are several million acres of undeveloped arable land north of Grimshaw, a large portion of which would be serviced by a railway along the West Route. It is said that we now suffer from a surplus of grain and that it would be a mistake to encourage the growth of more grain. It seems to me, however, from the inquiries we have made, that we can reasonably hope that the situation regarding the present wheat surplus is more or less temporary and that the prospect for agricultural expansion in the fairly near future is bright -- probably just as bright as the prospects for finding mines along the proposed Eastern Route of the railway.

The case for agricultural expansion was outlined recently by the Honourable John E. Brownlee, President of United Grain Growers Limited and formerly Premier of Alberta, in a speech on "World Outlook for Canadian Grain", and I quote the following extracts:

"The agricultural economy of the prairies as a whole and to a great extent the economy of all Canada was developed and still largely rests upon the export of wheat. The great period of expansion was in the first quarter of the present century. Railway building and the settlement of the prairies opened to the world a vast new storehouse of food at the very time when Europe, including the United Kingdom, had an insistent need for increased supplies of wheat from across the Atlantic. In part that was due to industrial development and population growth; in part it was due to the drying up of previous sources of supply for exported wheat such as Russia and India, and the Danubian basin where agriculture had a great set-back from the first World War.

Then followed a period during which channels of international trade were disrupted or destroyed during the great depression of the 'thirties and as a consequence of the second World War. That condition persisted until well into the 'fifties. I recall, for example, attending the International Wheat Agreement Conference in Washington in 1953. Many different countries then were clamouring for a share of limited world wheat supplies. No one then, just seven years ago, foresaw the accumulation of a world wheat surplus, which began to build up almost immediately afterwards, and which has greatly troubled us during recent years."

* * *

"What then are prospective world needs for food as they can now be envisaged? Of primary importance in that connection is a tremendous and explosive increase in world population now in progress for many years and continuing at an extraordinary rate."

* * *

"In 1955 the population of Canada was about 15½ million. We started this year with 17½ million and the (Gordon) Commission foresaw a possible 27½ million in 1980. Put another ten million people into Canada in the next twenty years and Canadians are going to need a great deal more food. Much of the increase will be in meat, dairy products and poultry products. To produce this will require a great deal more prairie grain."

MINING

There are four aspects of mining to be considered in relation to the railway:

(1) The railway on either route will assure the opening of the Pine Point mine.

(2) The West route does not go through prospective mining country until it reaches Pine Point.

(3) The railway along the East route would be available to give service to mining development, if this occurs, between Lake Athabasca and Great Slave Lake. This is an area which geologists say should not be "written off" but which they do not appear to be greatly interested in at the present time.

(4) There appear to be excellent prospects for finding mines in that area between Great Slave Lake and the Arctic Ocean. A railway to the south shore of Great Slave Lake would not be of immediate assistance to the mining industry of this area, but could constitute a first leg of a much longer railway to any mine that might be found north of Great Slave Lake, if such a mine is rich enough to warrant such a railway.

Geologists seem to agree that any mineral deposits that exist along the Western Route will lie under a great thickness

of sedimentary rock or "cover". These deposits probably could not be found, and even if found, are so deep that they would not be economical. It appears therefore that a railway along the West Route would not pass through any prospective mining country until it reached Pine Point.

It should perhaps be remembered also that gold mines and uranium mines are not materially affected by a railway because the product of these mines has a very high value as compared with its weight and is readily shipped by air.

There therefore remains to be considered those mining prospects which the proposed railway could affect. In addition to Pine Point, those mining prospects are the country adjacent to the Eastern Route and the country north of Great Slave Lake.

The area that is more or less adjacent to the proposed Eastern Route lies between Great Slave Lake and Lake Athabasca and has large exposures of Pre-Cambrian rock where commercial orebodies could occur, although geologists do not appear to like this nearly so well as the area north of Great Slave Lake. One geologist, typical of those who lack enthusiasm for the country south of the Lake, told us that he is considering a large exploration program. He proposes to expend all his money and efforts north of Great Slave Lake and nothing on exploration south of Great Slave Lake. He would not "write off" the area to the south entirely but would be prepared to go there to examine a piece of property only if it is recommended to him by a geologist or prospector in whom he has confidence. Others are less pessimistic and have pointed out that there are substantial quantities of the type of

rock in which commercial orebodies have been found in other parts of Canada.

The area north of Great Slave Lake looks much more encouraging and the prospects for finding mines are excellent. In stating this I should point out that the area north of Great Slave Lake is extremely large and no geologist or engineer has been prepared to state within great distances where mines are sure to be found. To this area, the Lake itself is a serious obstacle. It is frozen for seven months of the year and even for the five months of open water there are several weeks of very stormy weather in the fall. An additional hazard to navigation is the very shallow water for considerable distances out from practically the whole of the south shore of the Lake, with very little in the way of good harbour possibilities, as explained in Chapter IX of this report.

A railway to the south shore of Great Slave Lake could benefit a mine north of Great Slave Lake in a manner similar to the way railways at Grimshaw and Waterways now would benefit a mine at Pine Point; in other words, it seems that the railway to the south shore of Great Slave Lake has no immediate advantage for the mining industry north of the lake but could be the first part of a much longer railway built around the Lake to any mine that may be found, if that mine is large enough and rich enough to warrant a long railway haul.

It was urged upon us that mines north of Great Slave Lake could take advantage of the proposed railway by shipping concentrates across the Lake for further hauling by the railway.

But the concentrates could be shipped across the Lake only during five months of open water and at that time the river

route to Waterways is also open. If products of mines are available in substantial quantity on the north shore of the Lake there appears to be no reason why the Northern Transportation Company could not bring them to Waterways for almost as little, if not for less than the freight rates suggested for the new railway.

The great advantage of the railway over the river route is that the railway would operate for 12 months of each year and the water route for only five months; but with respect to freight from the north side of the Lake the railway would have little or no advantage because the Lake itself prevents transportation from its north side during most of each year.

FOREST INDUSTRY.

In this respect neither route has an advantage over the other.

I concur in the opinions of Dr. Gainer that there are timber reserves along each route that would be serviced by a railroad, but that neither route appears to have any marked advantage over the other from this point of view. I would like to add only a few comments.

It was pressed upon us that in the Wood Buffalo National Park there is a great national resource in the form of mature and over-mature timber which should be cut within the next two decades or it will deteriorate and be lost. At the present time there is a substantial lumbering operation being carried on in the Park and the lumber is transported by water by the Northern Transportation Company, which is owned by the Government. The freight

rate is $7 per ton from Fort Fitzgerald to Waterways. The owners of this timber argue that they can make only a very small profit under present conditions but if the railway were built they would hope to have cheaper transportation rates which would enable them to harvest larger quantities of timber. The basis of this argument is the assumption by the owners of the timber that "Spokane rates" would apply to lumber shipped from Fort Fitzgerald. The Spokane rates are a set of freight rates that have been agreed upon amongst railways of the Northwestern United States and Canada pursuant to which lumber from any part of a large area travels to points in Eastern United States at one set rate; for example, if the Spokane rates should apply over a railway north of Waterways, as the timber owners are assuming, lumber from the Wood Buffalo Park would travel to Chicago at the same rate as would lumber from Waterways to Chicago. Consequently it would mean, in effect, that there would be no additional railway revenue for lumber travelling over the new railway. The railways anticipate only relatively small revenue from lumber, their highest estimate being less than a total of $30,000 per year.

It seems to me that if the argument of the timber owners is sound and that it is very highly desirable that the harvest of the Wood Buffalo lumber be assured, it would be very easy for the Government to put into effect something similar to the Spokane rates by directing its own company, the Northern Transportation Company, to reduce its freight rate from Fitzgerald to Waterways. I am consequently unable to see the situation regarding

timber as anything more than a small factor in either route for the railway.

COST OF THE RAILWAY.

The estimated cost of a railway along the West Route is less than that of a railway along the East Route. There is so little known about building conditions along the East Route that the actual cost might be considerably greater than what is estimated.

Major J. L. Charles of Winnipeg is an eminent engineer who has had extensive experience in outlining routes and estimating costs of railways. In the summer of 1957 Major Charles made a "preliminary reconnaissance" of each route and he outlined to us in some detail what he had found. In his opinion the West route has very few physical obstacles and although the East route had obstacles in the form of numerous creek and river valleys coming into the Athabasca River from the west which would have to be crossed, together with much muskeg between Fort Smith and Pine Point, he felt that the railway could be built without much difficulty from McMurray to Fort Smith and then in a direct route from Fort Smith to Pine Point.

With regard to the East route we have had several private opinions expressed with much emphasis that the direct route from Fort Smith to Pine Point through the muskeg would be very costly and if the railway was to follow the East route it

would be much better to build it in a sort of semi-circle to follow an escarpment that would provide a much easier route over which to build.

It is only with hesitance and reluctance that we would question Major Charles' opinion, but Major Charles emphasized to us that he had made only a "preliminary reconnaissance" and not even a "preliminary survey". Several engineers who have spent some time on the ground in the muskeg area have very grave doubts about the muskegs. They did not have a railway in mind when they were on the ground and they are not experienced railwaymen, but their opinions were so emphatic that it appears to me that if the railway is to be built along the East route there might be warranted at least the preliminary survey that Major Charles was not able to make during the summer of 1957. To this extent, it appears to me that the West route has an advantage in that there appear to be no doubts about the relative ease with which a railway can be built; whereas there is much less known about the terrain of the East route, which has raised grave doubts in the minds of a number of competent men.

RELATIVE REVENUES ANTICIPATED FOR THE IMMEDIATE FUTURE.

In this respect neither route has an advantage over the other.

The brief of the railway companies favored the Eastern Route partly, it was argued, because there are immediate

prospects for considerably higher revenue for a railway along the East Route than for a railway along the West Route, as follows:

(a) the railway companies estimate only $15,000 per year revenue from agriculture along the West Route and nothing from agriculture along the East Route;

(b) they estimate $9,405 per year for lumber along the West Route and $28,980 per year for lumber along the East Route;

(c) they estimate the revenue for concentrates from Pine Point could be $100,000 per year more over the West Route than over the East Route;

(d) there is now approximately 100,000 tons of freight going from Waterways to Uranium City. It is carried by Northern Transportation Company for $1,300,000. The railways want this freight to go by rail from Waterways to Peace Point for $600,000 and by water via Northern Transportation Company to Uranium City for $700,000.

The main difference between the immediate revenues anticipated from the two routes is the $600,000 the railways plan for carrying the Uranium City freight as far as Peace Point. This suggestion appears unsound. Even if the freight is carried by rail to Peace Point, there is still the water haul from there to Uranium City; and the cost of carrying the freight by water from Peace Point to Uranium City will be practically the same as the

present cost of carrying the freight from Waterways to Uranium City. Senior officials of the Northern Transportation Company estimate that there could not be a saving of as much as 10% and the saving would likely be no more than 5%.

Consequently, if the railway proposal were adopted, a capital expenditure would be required for shipping facilities at Peace Point. Even then, the water transportation from Peace Point to Uranium City would be very little less than the present water transportation. The end result would be either the railways would have to carry the freight for a nominal figure or the Northern Transportation Company would have to suffer a heavy loss or the people of Uranium City would have to pay a much larger freight bill.

The argument of the railway companies in this matter appeared to assume that if the railway is built along the East Route, water transportation will cease to exist along the Athabasca River and the railway company would then have a monopoly on hauling freight from Waterways to Peace Point.

Railway monopolies sometimes produce strange results with regard to freight rates. For example, the railway companies in advocating the East Route, emphasized that an advantage of the East Route over the West Route is that from Edmonton to Waterways is an easier railway to operate than from Edmonton to Grimshaw. Both railways are operated by the same company, but notwithstanding this argument

(a) the railway rate on fuel oil from Edmonton to Grimshaw (the longer and more difficult route) is 55¢ per hundred pounds,

(b) the railway rate from Edmonton to McMurray (the shorter and easier route, but the route over which there is a monopoly for over half the distance) is 99¢ per hundred pounds.

As stated above, in the question of immediate revenue, it does not seem to me that there is any material difference between the two routes.

A comparison of future revenues (which would make the railway a "paying" proposition) depends on the future of agriculture in the west and the future of mining in the east. This is dealt with elsewhere (in the sections on agriculture and mining) and summarized in the concluding paragraphs of this report.

C O N C L U S I O N

As between the proposed Western Route and the proposed Eastern Route, we have been assured that it is a matter of "minor importance" to the Pine Point mine which way the railway goes.

The main case for the Eastern Route is that a railway will be in existence and ready to give service to mining develop-

ment, if orebodies are found in the area more or less adjacent to the proposed Eastern Route. On the other hand, a railway along the Western Route will be available to give service to large agricultural development, if that should take place, in the millions of acres of arable land lying north of Grimshaw. We hope there will be both agricultural expansion (as explained above in the quotations from Mr. Brownlee's speech) and development of mines, but I think it is impossible to conclude now which is more likely. Consequently, this major issue as between the two routes cannot now be resolved with any certainty.

The remaining issues between the two routes seem to me to favor the West Route; a railway from Grimshaw would give service to communities already established and would be easier and less costly to build.

CHAPTER IV

REPORT OF COMMISSIONER W. D. GAINER

AGRICULTURE

From what has already been said of the size and location of the farming potential to the north of existing railhead, it is clear that a westerly rail route would traverse a very much larger present and latent agricultural resource. It is also evident that a gradual growth in farm production and shipments can be expected from this region.

Several characteristics of the likely future pattern of this growth which are relevant to the question of railroad routing are also evident:

1. Agricultural expansion will tend to fill in and concentrate over a 200 mile stretch of territory immediately north of Grimshaw.
2. While a railroad will not improve the present degree of accessibility for settlement in this region, it is expected that the freight economies provided on some farm products by a railroad will help farmers to increase the rate at which unimproved land is broken out for cash cropping as well as to provide some economic incentive to new settlement.

3. A large part of the arable potential of the area exists on the east and south side of the Peace River valley so that any economic benefits of a railway on the west side will be greatly scaled down in terms of benefits on the east side for a given straight line distance from rail.
4. Since the region is already served by a system of roads and a first class highway, truck competition on the movement of livestock, of general freight, and to a lesser extent of small seed grain will continue severe; the benefits of rail transportation to the district will therefore tend to be oriented mainly towards the cereal grain producer.

As a consequence of these factors and others mentioned elsewhere, it is felt that a single rail line extending from Grimshaw north to Hay River will provide relatively little incremental revenue to the carrier in the future even in the event of a very rapid expansion of farm production in the district. This is so because of the relatively short haul associated with grain shipments over the new line for many years to come, and because a rail carrier may continue to be ineffective in competing for a large part of the livestock and many types of general traffic against truck carriers operating over a first-class highway. Stated differently, high farm transportation costs in the north Peace River district will not be revolutionized by the presence of a railroad on anything but grain shipments - and particularly cereal grain shipments.

This is so because of a relatively low value per unit weight and because of the particularly low rail rates applicable to grain movement. Moreover, a large section of the arable potential of the district east of the Peace River will not be served economically by a railroad west of the valley even on a grain haul. In time, the whole district would be best served by a spur line system operating on both sides of the river, and able also to tap the large timber resources east of the Peace River and along the Wabiskaw River.

In terms of any social benefits that railroads were once able to provide to settlers by reason of improved facilities for personal travel and communication with other regions, there are none to be associated with a railroad extension to the west. In our day, the means of personal travel and communication are far more uniformly and cheaply provided by means of such facilities as roads, radio and line telecommunication and the like. This fact of our times is generally recognized by most people. There is no social magic now to be achieved by the arrival of a railway in the region adjacent to the Mackenzie highway. The only effects can be stated in cold economic terms of dollars and cents to shippers. In these terms, it is recognized that grain shippers north of Grimshaw will benefit substantially - at current truck and rail rates perhaps to the extent of around 7¢ per ton mile, or nearly $100 on a 1000 bu. shipment of barley from Manning to Grimshaw (55 miles). More distant shippers would

benefit more, depending on size of shipment and distance from present railhead.

Cost reductions of this order are substantial for the individual farm producer, and this cannot be denied. On the basis of present shipments and farm population, they are not large for the district as a whole. On the previous estimate of 36,000 tons of grain shipped out of the district over a weighted average distance of 65 miles, savings of 7¢ per ton mile would amount to some $164,000 in total. These would be spread over something like 1000 farms in the district. As further growth of settlement and cultivated acreage takes place northward, the size of this aggregate annual saving in freight will build up gradually over the years.

There can be no doubt then that a westerly rail extension would produce a marked reduction in the cost position of grain producers in the district surrounding Manning and north ultimately perhaps to the region east of Hay Lake. This would appear to be the major merit of a westerly route now and in the future. At the same time, to provide these reductions to local producers will yield relatively little to the revenue base of the rail extension, and could conceivably prove costly either to taxpayers or to other rail users unless the extension is able to generate a much larger proportion of higher-rated freight. It is the position taken here that even substantial growth of the farming industry north of Grimshaw and adjacent to the Mackenzie highway will not place a westerly

rail extension in a strong position to generate large future increases in higher-rated commodity traffic.

FORESTRY

It is indicated from the figures presented in the section on forestry that the sustained yield potential of the forestry resource considering all species is somewhat greater over the northwesterly portion of the province of Alberta than in the northeast section (see Table IV accompanying map in Volume II). This seems true for both the sawlog and pulpwood potential, although it is known that the proportion of the more desirable coniferous forest cover is somewhat higher to the northeast than to the northwest. Moreover, the definitions which are used to assign certain forest inventory blocks as being adjacent to one or other of the proposed rail routes are somewhat arbitrary. Taking into account both of these factors, clearly the amount of new production likely to be generated or encouraged in the future by a railroad will not be significantly different as between the two routes. And from a railway point of view, it has already been noted that lumber shipments to eastern markets are not large producers of incremental revenue accruing to a rail extension by relative standards. That is to say, lumber traffic, like the export grain traffic, does not go so far on a per ton basis as most other types of traffic towards meeting the incremental costs of operating extended rail services.

The same cannot be said of a pulpmill operation; however, such operations are large generators of freight tonnage, a large proportion of which consists of high-rated freight. Because of the nature and volume of freight required in a pulping operation, a railroad is still a practical necessity for such an industry. It is not possible to state, however, that a pulp mill is likely to require a rail extension north along the proposed westerly route any sooner than along an easterly one. The best evidence made available to the Commission suggests that as pulp mill capacity increases in Canada, some of this expansion must undoubtedly begin to tap the inland forestry potential of Alberta as more favourable spreads elsewhere in Canada are progressively taken up. It is not possible to say how soon nor how rapidly such a development is likely to go forward in Alberta. It has been suggested, however, that as the development progresses, it is likely to be concentrated first along the eastern Rocky Mountain slopes in west central Alberta and later to the northwest and eventually northeast. From the point of view of a sustained annual potential for pulpwood materials, there is at present sufficient potential in Alberta forested regions already served by rail to support at least two and perhaps three additional mills. From a density and renewal of cover point of view, these more southerly regions are to be preferred for a pulp operation in any event before the necessity arises to tap more northerly regions. If and as pulp mill capacity must move north in the future, it

is the view expressed here that a rail extension north of Grimshaw to Hay River will be too far east in its northern stretches to provide the most economical access to the densest regions of pulpwood potential to the west. Mill capacity in the future is likely to proceed northwest from the Fort St. John or Hines Creek regions along the Nelson and Liaird River watersheds to the vicinity of Fort Simpson on the Mackenzie River. This section of northeastern British Columbia and the Territories also gives promise of a greater sustained pulpwood capacity than anything evident in the northeastern section of Alberta north into the Territories.

From the point of view of long-term forestry potential along the two routes here under consideration then, there would seem to be little more merit to one route than to the other on balance. A westerly route north of Grimshaw indicates a greater sustained yield of sawlog and pulping material in regions generally adjacent to the route, but a larger proportion of this potential consists of hardwood materials (mainly black and white poplar currently less desirable for logging and pulping operations). In the more immediate future, it is also likely that a higher proportion of new production and shipments will be forthcoming from the more southerly portions of any new extension north of Grimshaw. Such shipments will therefore tend to contribute less revenue to the support of the new extension than is likely to be the case on an easterly route where lumber shipments will utilize

a longer haul over the new line.

In summary then, and over the long term, considerations having to do with development of the intermediate forestry potential along either route do not seem to weigh heavily in favour of one route in preference to the other from the standpoint of either employment and production or of railway revenue in the future.

MINERALS

Aside from the concentrates and general freight generated by the Pine Point base metal operations, the conclusion here is that an easterly route from Waterways to Hay River via Fort Smith is and will remain in a better position to serve present and future commercial mining operations either directly by branch extension or indirectly by integration with other types of freight carrier. This is the case since an easterly route is so located as to permit direct connections with future road or lake carrier at minimum additional outlays. That such future connections to rail will at some time be required to serve present and future mining properties is not held to be in doubt by this Commissioner. Technical opinion before the Commission left no doubt but that commercial mineral prospects were considerably greater in the pre-cambrian and precambrian-paleozoic interface regions along an easterly route than over regions embodying the deeper paleozoic sediments to the west. Since a railroad must function over a long period of time into

the future, such probabilities are not to be discounted entirely.

Nor is it necessary to think entirely in terms of future mineral prospects. The uranium industry of Lake Athabasca at present must operate on the basis of a four month barge season for all bulky and heavy materials and supplies moving in - and this to the extent of over 100,000 tons annually. The annual costs of storage on this volume of shipments over the winter months are very substantial. These costs alone are sufficient to provide a large incentive for the construction and use of a winter road connecting the Beaverlodge area with a northerly rail extension from Waterways. In the opinion of this writer, such a road would soon be forthcoming from Uranium City to the Fort Smith area in the event that the latter region were to be served by rail. This kind of development is likely to take place, as it has already in the Yellowknife region, purely on the basis of transport and inventory economies to be achieved on inbound freight, and despite the fact that uranium mining, like gold mining, is not so dependent as most other types of mining on minimizing unit transport costs on outbound product or concentrate.

Even on the basis of existing mining activity then, an easterly rail extension from Waterways to Hay River will make available the same potential transportation alternatives to the Lake Athabasca region as will be available to the Great Slave Lake region. In terms of both present and future mining

developments in the area, this is a merit of an easterly rail route which cannot be dismissed. Once again, it is not a question of whether or not the existing gold and uranium operations on Great Slave and Athabasca lakes can persist in the absence of rail and road transportation. They have done so in the past at some additional cost and inconvenience in the same way that agriculture has developed north of Grimshaw, and in the same way that lumbering has developed north of both Grimshaw and Waterways. It is quite evident, however, that the cost position of all of these industries could and would be improved by making some (not necessarily total) use of rail or combined rail and road facilities as an alternative to an air or four-month barge haul. If a railroad north of Waterways were eventually to carry as little as five percent (or about 5000 tons annually) of the present traffic moving into Lake Athabasca, the additional revenue generated to the carrier would amount to more than that anticipated on a 50,000 ton grain haul north of Grimshaw. This is so for two main reasons:

1. Because the inbound mining freight would move at rail rates of from 2 1/2¢ to 5¢ or more per ton mile (barge rates on general merchandise from Waterways to Bushell or to Fort Smith are currently about 7¢ per ton mile), as compared to a rate of about 1/2¢ per ton mile on the outbound grain movement from north of Grimshaw, and
2. Because the inbound mining freight would move over the new rail line from 225 miles (to Peace Point) or 300 miles

(to Fort Smith) as compared at best to an average of 100 miles on the grain movement over an extension north of Grimshaw.

Stated more generally, the revenue prospects for an easterly rail extension in the near and more distant future appear very much greater to this observer than seems evident for a westerly rail route. Such is the case because of the greater prospects for inbound mining traffic in the near future as well as outbound mining traffic in the more distant future. Not only will such freight be required to move out longer distances over any new rail extension northward, but it will characteristically yield from three to as much as ten times as much revenue per ton mile as will export grain shipments - and more in the absence of competition from road or water carriers. In other words, such traffic is relatively high-rated as compared, say, to grain shipments or to the eastern lumber haul.

The relevance to the present argument of greater traffic revenues to the rail carrier - given the same capital and operating costs - is simply to assure to the carrier the greatest return or least loss on its operations over the new extension - and hence to its operations as a whole. The lower this increment of net income in a regulated industry, the greater will be the revenues required of other users or conceivably of the general tax-paying public. It is therefore a matter of widespread concern - even after a capital subsidy to the railroad - that the financial results on the new operation are as favourable as possible (whether as profits or losses) so as to minimize the associated financial strains placed on

users of the rest of the system.

If and when further mining activities are undertaken in northern Canada, it is amply evident that mine operations under isolated conditions must operate at many cost disadvantages as compared to other Canadian and foreign producers. An easterly rail route north of Waterways will carry existing railhead some 200 miles closer to the Canadian Shield than would otherwise be possible. In addition, it will provide a considerable length of rail to which spurline road or rail connections can be made as required without traversing an additional 200 miles for a connection.

SECONDARY AND TERTIARY INDUSTRIES

The discussion so far has concentrated mainly on the prospects for growth in certain of the primary industries important to the region under consideration. Some consideration ought also to be given to the prospective employment income and freight generating capacity of the secondary and service industries likely to be associated with the alternative rail routes.

Both regions under discussion show some prospects for industrial growth in the future, although such expansion is frequently a slow process in its initial stages. The type of industrial growth most likely to be associated with the two regions is apt to be quite different, however.

The prospects for the region between Peace River town and Hay River on the westerly route will be mainly those characteristically associated with the prairie economy in the past - the food processing industries, sawmilling, transportation services, farm services and supply, retail distribution services, and the small service industries generally. Growth will not be extensive in these lines for many years even with a railway and in the face of a rapidly expanding agriculture because of established services of the same type already offered in a number of fairly large centres to the south, because of settlement limitations to the east and west, and because of a natural attraction for some service enterprises to the port and transhipment facilities of Hay River as the new railhead to the north. By and large, increased commercial activity is likely to be concentrated mainly at the terminal of a rail line, in the Peace River - Grimshaw supply and service region, and at an intermediate point, (e.g. High Level which will offer road connections with the Fort Vermilion region).

There seems little prospect of secondary industry developing in the intermediate region for many years since the basic resources of the region do not differ markedly from those of many other and proximate regions where commercial services are already well developed. But in any event, some slow and steady growth of town and village service centres is bound to take place with the growth of the farm community. A railway will act as a stimulus to this growth to the extent that agriculture is stimulated. This is not to say that the

prospects for secondary and light industry are poor for the Peace River country generally. On the contrary, these prospects seem substantial - and indeed as bright as anywhere within the prairie region of western Canada. Nevertheless this kind of development will almost certainly not take place between Peace River town and Hay River for many decades. Instead, industrial growth will tend to concentrate on the established centres in the southerly and westerly portions of the Peace River territory. Much of it of course will spill over to even larger centres to the southeast and southwest. All of this type of growth, however, can and will be served by existing air, road and rail facilities. As a result, such developments will not be heavy direct users of any new rail extension north of Grimshaw.

A rather different pattern of industrial prospects is visualized for the region north of Waterways to Fort Smith and beyond to Hay River. Unlike the potential agricultural region north of Grimshaw, the growth of numerous small service centres so characteristic of the prairie region is not assured. By and large, a secondary industrial development in the northeast section of Alberta is likely to take place in large sporadic bursts - or not at all. The natural or physical advantages available to large units of secondary industry are extensive along the Athabasca valley up and downstream from Waterways. This is so due to the large complex of relatively isolated hydro-electric and oilsand energy reserves which can be used most economically if used close at hand and in

large volume. The region is generally well suited then to the location of a few large types of secondary industry associated with the mining or forestry industries where the availability of industrial water, raw materials and energy sources are overriding factors in location. Even in the event of such developments going forward, it is not necessarily assured that they will be located sufficiently far north of existing railhead to make extensive use of any new extension north. In the long term, however, it is the view of this writer that the natural advantages available to the location of secondary industry are and will remain considerably greater along the Athabasca and Slave river valleys than is the case between Grimshaw and Hay River.

GENERAL GROWTH AND MARKET FACTORS.

The construction of a railroad involves a very high initial capital outlay for facilities which must remain fixed geographically. Thus it is important to give some consideration to the potential demand for rail services in alternative regions or locations over a long period of time. This is so since the ultimate demand for extended rail services will be related in some fashion to the future growth of those industries which can benefit from the use of railroad facilities. For the regions here under consideration, the major developments for many years to come will be confined mainly to such primary industries as agriculture, energy, forestry and mining.

Several recent studies are available which deal with the prospects for growth over a wide variety of Canadian industries.[1] The details of the anticipated growth trends established for various industries in these studies are too lengthy to be spelled out here. But the general conclusions to be drawn from them are of relevance to the question of transportation routing for northern development.

In the first place, it is recognized that rapidly increasing world population and generally rising incomes per capita could provide a substantial theoretical increase in the total demand for many Canadian products - including the primary products of interest here. But in every study undertaken, the theoretical market potential is hedged by strong reservations in terms of the actual availability of this market potential in practice. These reservations stem mainly from the probable effects in the future of continuing trade barriers arising from protectionist motives or because of sustained balance-of-payments difficulties operating between this country and various of her trading partners.

(1) See, for instance, Royal Commission on Canada's Economic Prospects, Final Report (Ottawa, Queen's Printer, November 1957); see also the subsequent technical studies of the same Commission dealing with the particular resource industries here under discussion; also D. L. MacFARLANE AND J. D. BLACK, The Development of Canadian Agriculture to 1970 (Montreal, Macdonald College, McGill University, 1958); also R. E. Caves and R. H. Holton, The Canadian Economy, Prospect and Retrospect (Harvard Economic Studies, vol. CXII, Cambridge, Mass., Harvard University Press, 1959).

In the case of Canadian agriculture, these limitations to the expansion of foreign markets are viewed as being particularly severe. Thus it is expected that any future growth in the demand for Canadian agricultural products will stem principally from domestic sources.[1] Increased demand will be oriented mainly towards fruits, vegetables, livestock and poultry products.

All in all, agricultural production in the prairie provinces is expected to increase by about 50% in volume terms from 1955 to 1970, and by less than this for the rest of Canada.[2] Moreover it is anticipated in the studies mentioned that nearly all of this increase can be brought about without any significant increase in the size of occupied farm acreage in Canada. Such a conclusion is based on the effects of continuing improvements in farm productivity, e.g. improved livestock rations, feeding and breeding practices; higher average crop yields; irrigation developments; and in particular to a very large and steady reduction in acreage under summer-fallow. All of these things will be associated with a more intensive type of agriculture as farm demand and production shifts gradually towards the livestock enterprises. In the light of these comprehensive supply and demand projections, none of the studies cited is able to visualize any great pressure

(1) Royal Commission on Canada's Economic Prospects, Final Report, pp. 158-60.

(2) Caves and Holton, p. 633.

developing on new agricultural lands to meet projected demand over the next several decades.[1]

In the case of the forestry industry, growth prospects are brighter in some sections of the industry and in some regions of the country than in others.

The prairie forestry industry is expected to show the highest rate of growth as the pulping, plywood and hardwood branches of the industry take firmer hold in the west. Physical production in the prairie foresty industry is expected to increase by about 100% from 1955 to 1970[2], and by considerably less in other regions of the country.

In contrast, growth projections for the energy and mining industries are very much higher than for any other section of the Canadian economy over the country as a whole - and for the prairie region in particular.

Volume projections for Canada as a whole from 1954 to 1970 are of the following rough order: 450% expansion for the petroleum and natural gas industries, 150% for the metallic mining industries, and 95% for the non-metallic minerals industries.[3] In every case, these projections are slightly higher for the prairie region than for the nation as a whole.

(1) For a summary of such estimates, see especially MacFarlane and Black, ch. 4.

(2) Caves and Holton, Table 117, p. 633.

(3) Caves and Holton, Table 93, p. 532-33.

What must be stressed here is that the projections above are not based merely on the sheer productive potential or resource availability associated with the relevant primary industries. Instead the projections presume as well to take account of the differential expansibility of future domestic and foreign demand likely to be associated with the particular products of each industry. In this process, it is not enough simply to recognize a trend of rapidly increasing population and of industrial emergence the world over.

Account must also be taken of associated per capita incomes, of the existing state of industrialization and technology in various countries of the world, of natural resource endowments elsewhere as related to our own and of the extent of restriction operating against Canadian exports as a result of a host of political and economic influences present in Canada and in other countries. When all of these things are considered, it is clear from the available studies that the future production market prospects for some types of industry in Canada are considerably greater than for others. This is so even though substantial growth is anticipated for all, and even though all may face some degree of foreign market restriction from time to time.

As a result, it is also anticipated in the studies referred to that some industries will be able to acquire an increasingly large share of future Canadian export markets. Of the primary industries here under consideration, this is

expected to apply particularly to the energy and metallic minerals industries. The strongest underlying reason for such a development is the well recognized fact that the extent of world trade in primary products has depended and will continue to depend more than anything else upon growth rates of the advanced industrial countries.[1] It is in these countries that the per capita use of energy and metals grows more rapidly than for most other commodities as per capita incomes trend upwards. Canada has traditionally carried on over 85% of her trading with such countries - principally the United States and the United Kingdom. As a percentage, this figure is likely to increase rather than to decrease in the future. Canadian exports to the industrialized countries of semi-processed industrial raw materials have been and will continue to grow rapidly alongside a much slower growth in agricultural exports.[2]

It is argued here then that if a railroad is to be built to Great Slave Lake now, an easterly route from Waterways to Hay River is better positioned to reduce the costs of production and of marketing whatever commercial mineral deposits are present over a wide expanse of the precambrian exposures to the east and northeast and of the paleozoic to the west. Once again, this is not to argue that the existence

(1) Caves and Holton, p. 394

(2) For a summary discussion of Canadian agricultural export prospects, see Royal Commission on Canada's Economic Prospects, Final Report, pp. 158-60, and the technical report of the same Commission by W. M. Drummond and W. Mackenzie, Progress and Prospects of Canadian Agriculture, ch. 2, pp. 38-58.

of a railway will necessarily assure the presence or earlier discovery of commercial ore bodies over the area capable of being served. It is only to say that unless the whole region is proved over the years ahead to be utterly sterile of industrial and metallic mineral resources, then the railroad will prove of cost-reducing assistance to an industry which over the long pull shows brighter than average prospects for domestic and foreign market growth. Such transportation cost economies may bear significantly on the ability of northern producers to compete effectively with other producers in Canada and elsewhere who are located closer to the ultimate user. In the meantime, it is the view of this writer that general considerations of geology indicate sufficient probabilities of commercial mineralization in the Slave Lake (east arm) and Lake Athabasca regions as not to be completely ignored over the life of a railroad.

Having in mind both market and resource outlook then, it is the judgment of this writer that a railroad routed easterly from Waterways will contribute to a type and volume of economic activity which holds promise of adding a much larger increment to the value of Canada's national product and therefore economic development per dollar of public investment than seems evident for a westerly route out of Grimshaw. From the point of view of future additions to national income and production, it is to be realized that the value of production per man year in Canadian agriculture has been and is about a

third of that characterizing non-agricultural pursuits - and less than a third as compared to the primary mining industry.[1] What this implies is that a single mining venture of relatively small proportions (hiring about 300 men directly) would characteristically contribute as much annually to the national income and product over the life of the mine as the existing 1000 farm agricultural industry north of Grimshaw. It is therefore not expecting much at all of further mineral prospects along an easterly route to anticipate future additions to commercial exploitation many times this great. Such has already proved to be the case on the north shore regions of both Great Slave Lake and Lake Athabasca. In the latter region alone, for instance, the gross value of uranium production over the last several years has exceeded 50 million annually.[2] This is in contrast to an estimated gross value of agricultural production of from $3 to $4 million annually in the region north of Grimshaw. The Beaverlodge uranium operation itself has required over 100,000 tons of inbound water freight. If a railroad were eventually to carry as little as 5% of this traffic for forwarding by barge or winter truck haul from Peace Point or Fort Smith to Uranium City, the freight revenue generated to the railroad annually would be considerably in excess of anything expected on the grain haul to Grimshaw for

(1) Caves and Holton, pp. 288-91

(2) Saskatchewan Economic Review. (Economic Advisory and Planning Board, Regina, Government of the Province of Saskatchewan), March 1960, p. 14.

many years. For such a development to take place to this or a greater extent would require no new discoveries of commercial ore bodies, but merely the serving of existing operations by rail, if and as this can be done with greater convenience or economy to shippers than at present. This writer is in no doubt that this service can and would be provided gradually in the future as complementary winter and all-weather road facilities are developed in the area.

In summary then, what is suggested here is that a railway built either east or west could offer substantial cost reductions per dollar of product produced to certain segments of either the (easterly) mining or (westerly) farming industries respectively. On the basis of several estimates of Canadian industrial prospects in the future, and of the resource potentials of the regions here under consideration, the conclusion reached in this section is the following; namely, that the cost reducing potential of a northerly rail extension will be called upon to provide benefits over a larger and faster growing increment of future production and income in mining than in agriculture. It is no argument to assert that either industry could better get along without the services of a railroad than the other. The nature of the effects are of the same type in both instances. There are some types of mining activity (e.g. iron, base metals, industrial minerals) which will find the cost reducing benefits of rail transportation more critical to profitable operations than others. The same can be said of

certain farm enterprises (e.g. cereal grain production). In both instances, the effect of lower transport costs where these can be achieved through the use of a railroad is to enhance the net returns to producers whether these be farm owners or mine owners.

It follows too that the brighter the outlook for net returns in a private venture, the greater the incentive to undertake new production or to increase existing production schedules. If it is true, as this Commissioner thinks, that the tonnage prospects on mine haul over an easterly route are considerably better over the long run than for agricultural tonnages to the west, then the benefits and incentive effects of reduced transport costs over the years will be available to a larger segment of the national product along a route north of Waterways than one north of Grimshaw. If one is not convinced of the prospects for a more rapid build-up of rail traffic along an easterly route (arising mainly from existing and future mining activity in adjacent regions), then the effect just noted above will be absent. It is the view expressed here, however, that a rail carrier is still in a position to provide more economical and/or reliable service to shippers than is the case for summer barge operations under northern conditions, and that with the prospects in view for the mining industry, railroad services will be called upon extensively to serve future development in the area.

As mentioned elsewhere, traffic and revenue prospects of the proposed railroad extension must be viewed in

association with projected capital outlays and operating costs. It was noted in the section dealing with Engineering Cost Factors that the standard of ruling grade associated with a line from Edmonton to Waterways and beyond is likely to be greater (1%) than is probable for a line from Edmonton to Grimshaw and beyond (0.5%). With the exception of a "pusher grade" section on each line, it is indicated under the above conditions that a driving unit of given power could haul a train of roughly 60% more weight over the westerly than over the easterly route; or that roughly eight trains would be required on an easterly route for every five on a westerly route. This would indicate that certain operating expense items which vary strictly with the number of train-miles operated could be as much as 60% greater per given gross tonnage handled on the Waterways as compared to the Grimshaw route. This could apply to such items as engine fuel and engine repairs, maintenance and depreciation; to crew wages; and to certain yard charges for switching, marshalling etc. It would not apply in anything like the 60% proportion to such items as maintenance of way; station costs; repair, maintenance and depreciation of rolling stock required; nor to many types of allocated general overhead and administrative charges. The proportion of such costs bulks large in typical railroad operations (hence the importance of high volume to the reduction of unit costs), but exactly how large is difficult to say in the absence of a comprehensive costing of operations under a given set of conditions. Such a study is something

which this Commission does not have available to it. In the opinion of this Commissioner, it is unlikely that the fully distributed costs per ton of moving a given volume of freight would exceed 20% more over an easterly 1% ruling grade than over a westerly 0.5% ruling grade. It has already been indicated that in the opinion of this Commission, there is some reason to expect the initial capital costs of construction to run somewhat higher, perhaps by a factor of about 10%, on the easterly as opposed to a westerly route.

Thus it is the conclusion here from the limited evidence made available to the Commission on this point that the proposed Grimshaw route does have the merit on balance of being more advantageously situated from the standpoint of both construction and operating conditions. The extent to which these advantages will be reflected in more favourable ton-mile freight costs and in net return to the rail carrier will now depend entirely on the revenue volume of freight which is anticipated on either of the proposed routes. It is the opinion of this Commissioner expressed elsewhere that the freight revenue prospects for a railroad in both the short and long term are considerably better between Waterways and Hay River than between Grimshaw and Hay River - and by more than enough to compensate for the more unfavourable cost conditions anticipated for the eastern route.

NORTHERN DEVELOPMENT AND TRANSPORT FACILITIES

If the railroad extension under consideration here is to do the most to serve the interest of northern development in the future, then some consideration must be given to the anticipated long term requirements of the north for transport facilities.

It is not likely that the railroad can or will ever function in northern development in the same fundamental way that was true of earlier Canadian development. This is so for a wide variety of reasons which can only be touched on here. Because of the development of new types of passenger and freight carriers, the railroad no longer constitutes the only means of providing accessibility and communication to and between various regions and centres of population no matter how isolated. Even more important, more personal modes of travel have become available with the widespread use of the automobile particularly. As a result, the provision of all-weather roads at present stands as the ultimate and preferred social requirement in terms of personal travel at least.

In the case of freight movements, considerations of distance, terrain and low traffic density operating between centres of population in the north will preclude widespread use of the railroad except under very special circumstances. This is due in part to the high initial outlays involved in railroad construction under the conditions mentioned, and in part to the geographic inflexibility of the large investment

in road bed facilities once undertaken. The latter consideration is especially important if the carrier is basically dependent on any one type or source of traffic. Particularly in the exploitation of widely separated concentrations of depletable resources such as minerals then, there will always be a heavy requirement for a more versatile type of carrier in which the overhead investment can be readily shifted as between different uses or locations. It is here that new and at present unconventional types of air and integrated carriers can contribute so much to the development of northern Canada as technology advances in the future.

In the meantime, and for some decades into the future therefore, it is likely that a railroad will only be able to serve economically in northern Canada by providing a trunk line freight service so located as to be able to serve a very large territory in combination with other types of carrier. That is to say, the railroad will depend for the bulk of its traffic on the gathering and feeder services provided to it by other types of carrier such as lake barge or boat, bulk air freighters, pipelines, trucks, etc. It will probably be the case that the development of new modes of transportation in the future will continue to displace the economical use of a railway for relatively low volume use. But as a long distance all-weather trunk-line mover of freight, there will be for many decades a central role for the railroad to play as a backbone for a larger network of integrated transportation services.

In the case of the western Arctic, it is clear even at this stage in the development of northwest Canada that the Mackenzie valley has offered, and will offer in the future, the greatest natural advantages for diversified and permanent settlement and development. This is so not only because of the limited advantages of a navigable water route for transportation, but also because of more favourable climatic conditions and a more diversified physical resource endowment than is evident over vast expanses of surrounding territory. The Mackenzie valley may be expected to develop in the future as a service lifeline for a variety of primary industries located over a region some hundreds of miles wide on both sides of the valley. A well developed and diversified transportation system throughout the length of the Mackenzie valley to a port on the Arctic would serve to connect the resource industries of the north to both supply and market centres either abroad or in southern Canada. As part of such a basic trunkline system, rail transportation should be able to provide economical and dependable year-round service to a variety of shippers as soon as a reasonable volume of traffic develops. There is every reason to believe that the necessary volume of traffic will develop along the Mackenzie valley sooner than elsewhere in the Canadian northwest for reasons mentioned earlier, and because of its locational advantages to the mining industry for trunk line transportation situated as it is between the Precambrian rocks of the Canadian Shield to the north and east and a northerly

extension of the Cordillera region to the west.

In general, it would seem reasonable that any long-run concept for improved transportation facilities for northwest Canada should envisage at some stage in the future a rail extension north along the Mackenzie valley. A question arises as to how best might any such line of the future connect with existing centres and transport facilities in southern Canada. The concept put forward here is that the ultimate Mackenzie valley system of integrated water, rail, road and airport facilities should extend in a southeasterly direction so as to make use of the Slave River and Lake Athabasca water routes as well. Such would provide for trunk line service along or near the edge of the Shield from which feeder connections can be made from both sides using whatever type of carrier is most suitable for the kind of traffic involved now or in the future. In the provisions of feeder service, the bulk lake carrier may have an important role to play for many years.

It is the belief of this writer that the size and location of the mining development now in sight at Pine Point provides a sufficient economic justification for an extension of existing railhead as far north as a port on the south shore of Great Slave Lake. This extension, however, should be viewed as a part of an ultimate Mackenzie valley system. Taking all things into account, it is believed that Hay River provides the most advantageous location for the new

rail terminal and for future port development. From the point of view of the Pine Point development alone, it will make little difference whether railhead extension goes north from Waterways or from Grimshaw. In terms of using the opportunity to do the most for any future transportation system for the north however, the routing of the next extension may be a more important question.

A rail route from Hay River with connections to Fort Smith and Bell Rock harbour (at the foot of the Slave River portage), and to some water transshipment point above the Slave River rapids (in the vicinity of the Athabasca or Peace River deltas), and thence to a southerly transcontinental rail connection can function ultimately as a part of an integrated system of transport facilities serving the headwater regions of the Mackenzie valley. As indicated earlier, railroad construction into the north cannot be expected to serve all isolated developments directly. The most that can be done is to locate the limited rail facilities so as to make the best use out of present and future road, air and water connections. Thus it is considered important to the ultimate development of northern Canada that a rail line which can be justified now, be so located as to be in the best position for future connections with the same or other means of transportation probing northward in the future.

For purposes of future connections and integration into a main line system, Hay River, the region of the Slave

River portage (Bell Rock, Fort Smith and Fort Fitzgerald) and the region of the Athabasca River delta just south of Lake Athabasca are all likely to become important points of interconnection for transportation routes of the future as spot development proceeds anywhere to the northwest, the north or the northeast. The Waterways route terminating at Hay River will not only provide direct service to the Pine Point operation, but can also make direct connections with existing truck, air and barge operations for trans-shipment to Yellowknife or down-river Mackenzie points, and all such similar traffic in the future. The port of Hay River has many natural and acquired advantages for development as a major trans-shipment centre providing possible connections between air, truck, rail and lake barge or boat. A westerly route north of Grimshaw offers these same terminal advantages in terms of service to the general Slave Lake and down-river Mackenzie regions.

In addition to these services to the north in the future, an easterly rail route is placed in an advantageous position to provide further service to the easterly regions tributary to Great Slave Lake if and as required at relatively low additional capital cost. This is so to the extent that a relatively short rail or highway connection with a port on Lake Athabasca could be expected to serve the whole region peripheral to the lake through the provision of trans-shipment facilities to lake boat or barge. Because of problems of drainage and river crossings, overland connections to the east or northeast

are best made in the vicinity of the Slave River portage, or just above Embarras so as to run northeast across easy terrain south of Lake Athabasca. It is the view that any future system of integrated transport facilities in the Mackenzie valley from the Arctic coast to southern Canada should be capable of offering trunk-line service to the regions surrounding each of the three large lakes of the Canadian northwest. A rail extension undertaken now north to Great Slave Lake will provide an opportunity to commence building service to at least two of these regions. In addition, the location of rail service as far east as the Slave River portage will complement the existing well developed air and river barge facilities at present located in the Fort Smith region. Such facilities can provide connections as needed with any rail or truck routes serving the interlake regions between Lake Athabasca and the east arm of Great Slave Lake.

The considerations just outlined are admittedly oriented towards the long-run future. In such a context, however, it is the view of this writer that the proposed easterly route north of Waterways will be in a much better position to provide additional transportation services over a greater expanse of the northwest for given expenditure than will be the case for a westerly route north of Grimshaw. In terms of more immediate traffic prospects, it can also be said that an easterly route has the edge, although it would be a mistake to place too much emphasis on short-term development prospects.

As noted earlier, and in addition to traffic potentially available to either route, the westerly route will develop a considerable tonnage of grain over a limited extent of the route - probably in excess of 50,000 tons annually yielding upwards of $16,000 of incremental revenue annually to the new rail carrier. An easterly route would almost certainly assure a rail carrier of some 10,000 tons annually of general freight and petroleum products for the Fort Smith - Bell Rock area north of the Slave River portage. On the basis of estimates presented elsewhere, this traffic alone should yield a rail carrier over $100,000 annually of incremental revenue. It is true that any upward revision or subsidy equivalent applicable to the statutory export freight rate on grain could lead to an increase in the revenue generated by a given tonnage of grain on the new line - if and when any such revision is made. It is also likely that a sustained growth in the volume of grain shipments from the north Peace River district will take place in the future. But because of differences in the rate structure and distance factors applicable to the grain haul on the west as compared to the more general type of traffic to the east, the grain and other traffic on the west would have to increase at a rate beyond all reasonable expectations in order to provide financial support to the operation of a railroad equivalent to that of a much smaller tonnage of higher rated general traffic moving over longer distances on a new easterly extension. In terms of immediate prospects for paying its own way, it would

appear that an easterly route has a slight edge without counting on any of the traffic for Lake Athabasca points. Furthermore, no part of this evaluation so far is in any way dependent on speculation concerning new resource or other developments which some have cited as being almost assured along either route in the event of a railroad being constructed nearby.

In the case of the traffic already moving into Lake Athabasca, this trade gives rise to an annual freight bill beyond Waterways of some $1,300,000 million. As such then, the Uranium City traffic constitutes an ever-present potential for any competitive carrier offering more economical or convenient service to the shipper. It may be that a rail carrier for some years to come will not be able to do this. But the time will undoubtedly come, perhaps gradually, when this situation will change with respect to some items of freight at least. The day must come, as it has in other regions and countries in earlier times, when the demands of increased commerce give rise to a gradual displacement of river transport by the more convenient overland carriers for all but a high volume movement of a few low-rated bulk commodities. This reorientation of traffic will ordinarily come sooner for river carriers operating in the north than elsewhere because of the high rates and inconvenience brought on by a short four to five month season, and by the costs and delays involved in negotiating shallows, narrows, portages and storm conditions on the rivers and lakes. As winter and/or all-weather feeder roads are developed in

northern regions in response to as yet unknown developments, the proper location of a mainline transportation artery will become increasingly important to the economic feasibility of new production.

In the case of the present Lake Athabasca carriage for example, the medium-term outlook for the uranium industry in northern Saskatchewan as elsewhere in Canada is somewhat uncertain at the present time. However, a number of industry officials have expressed confidence that the major mine and mill operators in the Beaverlodge area will be among the last producers to succumb to such market pressures as may develop after the present contract stretch-out period expires in 1963. At worst it is expected that production from these operations might have to contract to about 50% of present levels after 1963. By 1970 and perhaps earlier, it is anticipated that new markets, together with a reduced proportion of a larger United States market, will provide an opportunity for stable and continuing growth. Short of a complete and permanent shut-down of all operations in the Beaverlodge uranium camp then, there will be a continuing opportunity for a variety of freight carriers to serve the region in the most effective way possible. It seems reasonable to expect that the services of a rail line bordering Lake Athabasca will be in strong demand to serve part of this or a similar traffic at some time in the future as complementary road and port facilities come into being.

Stated more generally, it is suggested here that there will always be many advantages to locating initially

a major overland transportation route serving the northwest as close as possible to the three great lakes which have always been prominent in the development of the region. In the event of new mining developments taking place on or near the perimeter of any of these large bodies of water, and long before great stretches of roads can be built over difficult terrain, it may be necessary at any time to shuttle general freight and supplies, or concentrates, or both, across these lakes by deep draught barge or lakeboat. This can be done to a port serving the whole of the lake and connected by rail spur line to mainline steel. Hence the advisability in the interest of development foresight of locating a railroad into the northwest, if it is to be built at all, in such a fashion as to provide the most economical access to the peripheral territory surrounding these lakes. To do so will at least provide the opportunity in the future for a rail connection with deeper-draught lake boats or barges plying a shuttle service on lake waters only. Proper lake equipment of this type will provide safety and economy features unapproachable by the present compromise use of shallow draught river equipment on both rivers and lakes. As the demands of commerce increase, the future role of water transportation in the north will shift increasingly to lake rather than river carrier. It is on the lake traffic that the major economies of the water carrier will persist the longest. The argument is not then to say that new mining and other developments will or are more likely to occur in any particular

region rather than in another. It is only to say that to locate a major all-weather transportation artery now so as to be able to serve the peripheral regions of two rather than one large lake at comparable initial outlay will greatly increase the potential ability of transportation facilities in the northwest to meet new demands at reasonable cost over a very large expanse of territory.

PUBLIC POLICY AND SOCIAL FACTORS

The foregoing analysis has so far been confined almost entirely to physical and economic considerations likely to bear on railroad routing. On the basis of these factors alone, this Commissioner is in no doubt but that the aggregate economic benefits of an easterly route out of Waterways give every indication of being greater than anything envisaged for a westerly route. Especially is this likely to be the case as time moves on in the future.

Without going into the details of the analysis up to this point, this conclusion is based principally on the differential growth prospects facing the farming industry to be served by a westerly route as compared to those for mineral production over regions capable of being served by an easterly route. The gross value of farm production for all of the region north of Grimshaw is estimated in the neighborhood of four million dollars annually. This is in contrast to some ten million dollars annually in the Yellowknife gold mining industry,

and over fifty million dollars annually in the Beaverlodge uranium mining region. While all of these figures may be subject to considerable short-term variation in the future, they are nevertheless useful for establishing a perspective. In particular, they give some indication of the direct and indirect income-generating capacity of the regional industries cited. This is so since the total value of production of a firm or industry must eventually take the form of cost payments to businesses supplying purchased materials (creating income indirectly to those engaged in the supplying industries), or cost and residual payments or credits to the labour, managerial groups, bondholders, real property holders and shareholders directly involved in the production of the firm or industry under discussion. That is to say, all gross revenues received for production by any business or group of businesses under observation must turn up as capital repayment and income receipts at some stage, by somebody, in some place, for some service or property contributed to that production. It is in this sense that the past growth rates of production in mining over the last twenty five years show evidence of contributing a good deal more to a rise in per capita income and the economic development of Canada than is true of agriculture for instance. All signs point to a continuation of these relationships for at least another quarter of a century both in Canada as a whole, and in the regions of special interest here. Hence it is the conclusion here that a railway will have

an opportunity to provide certain transport economies over a much larger addition to national production in mining than in the more restricted growth in agriculture.

Now while it may be true that the size of total production and income generated by mining activity is likely to outpace that in agriculture in the regions under discussion, this is not to say that the distribution of these income benefits will be at all alike. The benefits of any additional profit or production incentive resulting from transport economies will accrue directly to farmers or indirectly to those supplying farmers in the case of the agricultural industry. In the case of the mining industry, these benefits could accrue in part to additional employees of the industry where added production is encouraged and in general to mine owners or shareholders and to suppliers of the industry. In general it can be stated that the suppliers of both capital and of materials to northern mining activity will be distributed much more widely over Canada and in other countries than is true of farm owners and of farm suppliers involved in the industry north of Grimshaw (although the latter group is also widely distributed). Stated differently, any cost reducing benefits of a railroad to farm producers north of Grimshaw will tend to be more concentrated locally than would be true of benefits arising from cost reductions in mining activity. Whether or not it is more desirable to concentrate the benefits of a public outlay in the hands of one group of society in contrast

to another can only depend on an explicit statement in government policy as to why the public investment is to be undertaken. If the major purpose of the investment is to be thought of in terms of economic development of a particular region, then a great deal of emphasis must be given to the size and growth of the gross output (and therefore income) expected to be associated with alternative public outlays. Such calculations will be based essentially on the usual private investment principles of attempting to achieve the greatest economic return on a given public outlay. In the region here under discussion as specified in the Commission's terms of reference, and for the reasons outlined above, there is little doubt that a railroad would be associated with and called upon to serve a larger and faster growing segment of economic activity if so located as to maximize its service to the mining or manufacturing industries, for instance, than to the farming or lumber industries.

If, on the other hand, an expressed purpose of various alternative public outlays of funds is that of providing a special type of assistance to some region, or to some industry, or to some group of people in society, then the purely economic benefits or effects expected to be associated with the outlay can have much less significance. By and large, the criterion in this case will be one of economic need, or one related to the attainment of certain socially desirable ends quite apart from any economic values associated with these ends. This, too, is a legitimate type of policy for governments

to be engaged in. If it is to be a policy based on a criterion of economic need, there can be little doubt that the farming and prairie lumber industries, for instance, stand in greatest need of reduced costs of production (howsoever acquired) if a high rate of growth in sales and income is to be achieved in the face of a relatively restricted market outlook. Stated differently, the output-income growth prospects in primary agriculture in the absence of some special attention on the part of public policy are not nearly so great as seem evident, say, for many branches of the primary mining or the manufacturing industries. It might then be argued that for various non-economic reasons it seems desirable through public policy to alter the relative economic opportunities characterizing different industries.

Clearly what is required in this situation is some general agreement together with an explicit statement on the part of those within government as to which general type of policy is to be pursued in connection with a public outlay of funds for railway construction if such an outlay is to be made. From a reading of the terms of reference assigned to this Commission, this Commissioner can only think that the primary purpose of the projected railroad implied in the terms of reference is to do the most possible to aid in the economic (production and income) development of the northerly regions tributary to Great Slave Lake; or, in the only phraseology of the terms of reference which deals with this question, "for the

purpose of providing access to and contributing to the development of the portion of the Territories tributary to Great Slave Lake." If the above interpretation is substantially that intended by the drafters of the terms of reference, then there is no question but that the easterly portion of the tributary regions is at present less accessible by overland means of transportation than is the westerly portion. Since the natural resource of greatest economic value within the tributary regions as a whole will likely continue to be that of minerals, petroleum and hydro-electric potential, there can be no doubt but that a railway route from Waterways to Hay River would contribute the most to the combined development of both the easterly and westerly portions of the regions tributary to Great Slave Lake.

CHAPTER V

REPORT OF COMMISSIONER J. ANDERSON-THOMSON

SUMMARY OF REPORT

After a careful consideration of all the facts and opinions submitted to the Commission by the proponents of both the eastern and western routes the weight of evidence indicates that a railway extension originating at Grimshaw, Alberta, and following a route in the same general direction as the Mackenzie Highway and terminating at the Hay River Harbour, has much the greater merit in providing access to and contributing to the development of that portion of the Northwest Territories tributary to Great Slave Lake.

A railway following this western route will, in addition, traverse and contribute to the development of the only large tract of agricultural land remaining to the nation, land on which farm settlements may be possible as far north as the upper Mackenzie valley.

The potential in forestry products as deduced from the figures supplied by The Department of Lands and Forests of the Province of Alberta, would indicate a proportion of three to two in favour of this western route. The pulp potential alone on this route indicates that six pulp mills of 500 tons per day could operate and be served by this western railway, and pulp mills yield very substantial revenues to a railway.

Most important of all, and it is stated at greater length in another section of this chapter but will be reiterated here, a railway built along this western route will provide the opportunity whereby the present Government of Canada can liquidate an inherited and long outstanding obligation, and fulfil a more or less understood agreement that the settlers north of Grimshaw should be provided with a railway. The base metal mine at the northern extremity of this railway will help defray costs until the further development of farm and forest potential will make the railway at least self supporting if not highly profitable. The argument presented by the advocates of the eastern route that farm lands should not be opened up, can hardly be sustantiated in face of the evidence of population growth statistics, or at best will only be true for a very short period of time.

Other factors, also argued at greater length in the following sections of this chapter, which influence the choice of route, may be briefly summed up here:

(a) Primary Functions of the Railway.

If the railway is to be a truly developmental railway, and not just another branch line to exploit a mine, the western route is the only route which can hope to develop permanent settlement.

(b) Sociological factor.

The railway by the western route will determine whether the Dominion still has at heart the interest of the 'little man' or merely those interests pertaining to large urban and industrial

corporations.

(c) Population

A railway by the western route will serve a population of at present some 8,000 people, who are there of their own free choice and who are primary producers and must have cheap transportation for their produce. On the eastern route the majority of the population are not basic producers, are merely domiciled in McMurray, Waterways, Fitzgerald and Fort Smith, because that is their place of employment, and their main desire and need is for good highways, not railways.

(d) Engineering Factors

Engineering factors affecting cost of construction certainly seem to favour the western route.

(e) Mineral Resources

Transportation of the Pine Point ore will provide slightly more revenue for the railway by the western route.

(f) Traffic and Rates

Present traffic available to both routes has been set forth in Table V . Discussions on potential traffic took up much of the time in the hearings conducted by the Commission, but it seemed that predicting future traffic gave

wide scope for the imagination. Suffice to say that,making the proper original assumptions, and basing the proper assumptions on these, almost any desired end-result could be arrived at, depending on which route was being advocated. Rates are even more unpredictable than potential traffic, and what rates may or will be charged are merely conjecture. As far as the Commission could learn rates are set separately by each different transport organization to suit the different commodity and the different circumstances or the amount of competition. It is possible that the rates will have to be adjusted over the new line so that if there is a loss in the early years of operation, such loss will be distributed as fairly as possible.

Since the Commission was asked to enquire into the merits of the alternative routes, it may not be out of place to list what this Commissioner considers the chief demerits of the eastern route as compared with the western route.

(a) A railway by this route is not a truly developmental railway. It is more or less a railway to exploit the ore reserves of Pine Point.

(b) A terminus at Pine Point as suggested by the proposed route shown in the brief presented by the Northern Alberta Railways Company does nothing to give com-

petitive integrated transport to the Northwest Territories or the Mackenzie Valley.

(c) The proposed harbour at Isle du Mort (again suggested by the railways) is a poorly located harbour on the south shore of the lake. It would be very costly to construct, really offers less advantages than Bell Rock Harbour on the Slave River and would be competitive with neither road nor air transportation.

(d) Lack of competition on the eastern route, while possibly good for railway revenues is not good for the shipper. Considering just one example, the rates on oil from Edmonton to Waterways:

	Miles	Rate
Edmonton to Lac La Biche	133	22¢/100 lbs.
Lac La Biche to Waterways	173	77¢/100 lbs.

There is highway and truck competition as far as Lac La Biche but no highway from Lac La Biche to Waterways. The distance is 40 miles extra but the rate is 3 1/2 times as great. If the eastern route were followed the lack of competition would leave the railways in the happy position of basing their rates on the principle of 'value-of-service' which, as was explained to the Commission, simply means charging whatever the shipper is willing or able to pay, up to the generous maximum laid down by the Board of Trans-

port Commissioners or until some new form of competition forces a change in rates[1].

(e) In the event of the railway being built on the eastern route it would, from the evidence submitted by the railways, appear that some negotiations have been made to discontinue the water transportation on the Athabasca River from Waterways north. In advocating the eastern route we have the evidence of the railways; "We have gone on the assumption, AND NOT WITHOUT SOME BASIS FOR DOING SO, that the barge route south of Peace Point would cease to exist"[2]. And again "It would seem rather silly that a barge route, which involves costs to the Dominion Government should be competing with the railway, which presumably also will be built by the public, and the two Crown bodies competing in it would seem to be a waste"[3]. It is possible that an Order-in-Council could eliminate the Northern Transportation Company, but it would be rather poor economy to abandon a service which has been profitable and very efficient, and wasteful to give up or hand over the costly facilities already installed and

(1) Transcript 2275

(2) Transcript 1366

(3) Transcript 1367

dispose of the barges, tugs and dredging equipment. It might be wiser and more economical to build on the western route. But, supposing the barge route was discontinued then the towns of McMurray and Waterways and the settlements of Chipewyan and Fitzgerald would almost cease to exist because their economy is largely dependent on the river traffic.

(f) Using the rates given by freight experts, the Commission could come to no other conclusion but that, if the railway went by the eastern route, Uranium City would be paying almost $600,000.00 more to have the same tonnage of freight delivered if they used the railway instead of Northern Transportation barges.

(g) Since there is no farm land available along the eastern route, no permanent settlement could be expected.

The only possible merit that can be claimed for the eastern route is that if an orebody should be discovered not too far east of the Slave River, then a shorter spur line would be required to exploit this orebody than would be necessary if the main line was built further to the west. However, even this seeming merit has the following limitations:-

(a) The orebody has still to be discovered.

(b) If not discovered within one hundred miles

east of the Slave River, a spur line from Lynn Lake is closer.

(c) It must be a large base metal orebody, otherwise it provides little or no traffic for a railway.

Now it is hard enough merely to find orebodies without having restrictions as to the place, type and size of the orebody added thereto, since the location and all the features peculiar to each and every orebody were decided upon long before what geologists might term the Pre-Railway Age.

My colleague, Dr. Gainer, implies a very definite condition on a railway built on the eastern route, the condition being that the northern terminus be Hay River Harbour. If I could support that choice of route I would impose one further condition, namely, that construction be commenced at Hay River Harbour and the railway be built southward from this point.

PRIMARY FUNCTION OF THE RAILWAY

According to the terms of reference the railway is to provide access to and contribute to the development of that portion of the Northwest Territories tributary to Great Slave Lake. The primary function of the railway is developmental, as access is already provided by road, water and air. The railway is essential only if bulk commodities are to be hauled or if some public service is to be performed in the national interest.

The geographical location of the railway should

be such that the primary objectives are served. Essentially these objectives are as follows:

(a) Transportation of the Pine Point lead-zinc concentrates to a smelter.

(b) Reducing transportation costs to the District of Mackenzie tributary to Great Slave Lake, and to the Mackenzie Valley, thus facilitating development in those areas.

(c) In the public interest to foster the maximum development in agricultural, lumbering or industrial pursuits, to establish permanent settlement and to serve the greatest number of Canadian citizens en route.

It is quite clear that the first objective is assured by either route, the second objective is best served by the western route, and the third objective can only be attained by routing the railway on the western route, that is from Grimshaw to the Harbour of Hay River.

RAIL COMPETITION - HIGHWAY

Some doubts have been expressed as to whether a railway should be built paralleling a highway. It has been repeatedly suggested that since there is a highway linking Hay River with Grimshaw a railway is unnecessary and should be built in the east where there is no railway or highway as yet. It has also been suggested that too much competition is bad for both railway and highway transport facilities and therefore

a degree of monopoly should be maintained by geographic separation.

Such reasoning ignores the whole evolution of transportation facilities which has been based on competition. To get the most for their transportation dollar it is necessary to give shippers the opportunity of alternative forms of transportation which provide the desired service at the lowest cost. Business is then allocated to the most efficient carrier. Highways provide access and allow a limited development in areas devoted to primary production. Railways are the most economic carriers of bulk commodities over long distances. Thus, if the resources of an area are primarily mineral, forest or agricultural (grain) railways are essential for maximum development. Trucks will compete with rail for higher valued commodities and certain bulk commodities such as oil. The railway must develop the greatest volume of basic primary production to compensate for truck competition. Reduction in transportation costs in turn stimulate economic activity. This fact is of major importance to an area with high transportation costs.

A railway built from Grimshaw to Hay River, with a branch line to Pine Point, will provide the most efficient rail-highway and rail-barge combinations to the District of Mackenzie. Competition between truck and rail and between the two barge companies operating on the Great Slave Lake-Mackenzie River system will assure, to the shipper, the lowest transportation costs.

With rail connection to the natural harbour at

Hay River the maximum utilization of the short summer barge season will be attained. Hay River is approximately 581 miles from Waterways or a total rail and water mileage distance of 866 miles from Edmonton with a cost and time consuming portage at Fort Smith. The rail distance from Edmonton to Hay River via Grimshaw is 721 miles. In the winter time when barge operations are suspended, the railway by the western route, can trans-ship traffic to trucks at Enterprise (or Mile 28, which is 28 miles south of Hay River) for furtherance to points on or beyond Great Slave Lake or to points within trucking distance on the upper Mackenzie.

From the best estimates given to the Commission, it would appear that a reduction in truck rates of $14.00 per ton will be effected by the railway charging its maximum allowable rates to Hay River. Rail and barge rates will be reduced to Great Slave Lake and Mackenzie River communities by amounts varying from $4.00 to $19.00 per ton. (See Table I)

AGRICULTURE

The following statistics give some indication of agricultural possibilities in the areas adjacent to the railway routes under consideration:

	West Route	East Route
Arable Land(potential)	5,863,000 acres	-
Arable Land(doubtful)	886,000 "	-
Forest & Woodland	13,000,000 "	-
TOTAL[1]	19,749,000 acres	Nil

(1) Authority - Research Council of Alberta Exploratory Soil Survey.

The area presently occupied by farms north of Grimshaw is as set out hereunder:

	West Route	East Route
Improvement District #138	501,000 acres	-
Improvement District #146	34,000 "	-
Improvement District #147	166,000 "	-
TOTAL[1]	701,000 acres	Nil

The Northern Alberta Railways estimate that 50,000 tons of agricultural products will be hauled from present productive acreage north of Grimshaw. This area has approximately 700,000 acres occupied by farms. If half the potential arable land (2,900,000 acres) was developed together with more intensive cultivation of existing farms, tonnage to the railway would increase from 50,000 tons to 200,000 tons annually. This tonnage would include the incoming traffic. It would be reasonable to assume a subsidy on export grain to bring the rate up to 50¢ per 100 lbs. (i.e., $10.00 per ton) giving a gross revenue to the C.P.R. & C.N.R. of $2,000,000. per annum. However, if we consider the incoming traffic this rate of 50¢/100 is probably low.

Agricultural possibilities on the eastern route, as far as is presently known, are quite limited. There is possibly some farming land on the flats near the mouth of the Slave River which might support a local market. The fact that farmers have never moved into this country north of Waterways would pretty well indicate that the land must be unsuitable or

(1) Authority - MacGregor Report, pg. 43-44.

suitable only under severe limitations that present-day farming cannot meet.

FORESTRY

The statistical tables on timber resources shown on Table IV in Volume II were supplied by the Department of Lands and Forests (Alberta) and those for the Wood Buffalo Park by the Department of Northern Affairs and National Resources (Ottawa). These figures were then broken down by the Commission, allotting to each route the timber resources available should a railway be built along that route. The tables are a fair base for comparison and the totals may be briefly summarized here.

Potential in Saw Logs

West	East
8,466 millions f.b.m.	5,066 millions f.b.m.

WEST GREATER BY 67.1%

Annual Allowable Cut in Saw Logs

West	East
136 million f.b.m.	93 million f.b.m.

WEST GREATER BY 46.2%

Potential in Pulp Wood

West	East
99,136 thousand cords	51,125 thousand cords

WEST GREATER BY 93.9%

Annual Allowable Cut Pulp Wood

West	East
2,404 thousand cords	1,195 thousand cords

WEST GREATER BY 101.2%

The question of just how important timber resources are to a railway is somewhat controversial, and perhaps the railways alone know the answer, so we shall quote from page 19 of the Northern Alberta Railway Company's brief.

"Saw log timber - The gross annual sustainable yield of this timber is around 60% greater on the Waterways route than on the Grimshaw route.---- It is therefore concluded that a line north from Waterways would be better located to serve existing and potential forest industries than a line from Grimshaw." The statement contained in the first sentence is of course in error, but if the conclusion stated in the second sentence is based on the 60% greater yield, mentioned in the first sentence, then the whole paragraph should be amended to read, "Saw log timber - The gross annual sustainable yield of this timber is around 46.2% greater on the Grimshaw route than on the Waterways route.---- It is therefore concluded that a line north from Grimshaw would be better located to serve existing and potential forest industries than a line from Waterways."

The following summary[1] compares the potential traffic and revenue possibilities with respect to forestry products originating along each route:

(1) Authority for Volumes:- Department of Lands & Forest (Alberta).

Department of Northern Affairs (Wood Buffalo Park).

	West Route	East Route
Saw Logs		
Millions f.b.m.		
Volume	8,466	5,066
Annual Allowable Cut	136	93
Annual Allowable Cut Expressed in Carloads of 30,000 f.b.m.	4,500	3,100
Potential Revenue accruing to C.N. & C.P. Railways Revenue per car $800.00	$3,600,000.	$2,480,000.
Pulp		
Volume of Pulp-wood in millions f.b.m. (1 cord = 500 f.b.m.)	49,568	25,562
Annual Allowable Cut in millions f.b.m.	1,202	597
Theoretical number of 500 ton Pulp mills at 200,000,000 f.b.m. per annum.	6	3
Potential tonnage at 200,000 tons per annum	1,200,000	600,000
Rail Revenue @ $10.00 * per ton. * This would be close to a minimum rate.	$12,000,000.	$6,000,000.

In preparing the above summary no allowance was made for forestry potential north of the 60th parallel for either

route (excepting that portion of the Wood Buffalo Park which lies in the N.W.T.). With no available statistics it may be assumed that the potential for either route is proportional to that south of the 60th parallel.

MINING

Excerpts from a paragraph in a submission made to the Royal Commission on Canada's Economic Prospects by R. Gordon Robertson, Commissioner of the Northwest Territories in 1955 may be quoted here as an introduction to this summary of the mineral resources available as traffic to the Great Slave Lake Railway.

> "A railway to Great Slave Lake will be one of the great development railroads of the country ..... This railway is quite different from most branch lines constructed in recent years which were destined to serve one mine or a group of mines; its purpose is to open up a whole new region. The fact that there happens to be a potential mine of great value at its northern terminus is a piece of great good fortune .....".

This statement, which can hardly be improved upon, gives in very apt and concise language the whole concept of the Great Slave Lake Railway, and the final sentence, "The fact that there happens to be a potential mine of great value at its northern terminus is a piece of great good fortune", sums up in one statement the whole of our factual information regarding mineral resources available as traffic for the Great

Slave Lake Railway.

All other statements as to mineral resources are merely predictions, assumptions, or just plain wishful thinking, and the ore from Pine Point, since it is destined for the smelter at Trail and not to a seaboard point, can be transported equally well by either route. If as predicted, the 215,000 tons or more of concentrates per annum can be transported the 400 miles to either Waterways or Grimshaw for 1.6 cents per ton mile, the revenue accruing to the new portion of the railway would be $1,312,000 per annum, which would increase as the production of concentrates from Pine Point increased.

To exploit the resources of a base metal mine there is no type of transportation as desirable as a railway, except water transportation, provided that it is year-round operation, which unfortunately is not available in the Canadian North with an open-water season of approximately five months. It is <u>only</u> in the case of base metal mines, however, that a railway is so essential; precious metal mines can and have operated very successfully, even in pre-aircraft days, without the benefit of a railway.

There seemed to be some confusion or loose thinking regarding this matter of a developmental railway, and it was advocated in favour of the eastern route that this railway would help in the development of mineral resources in that part of the Precambrian Shield to the east of the Slave River and lying between Great Slave Lake and Lake Athabasca. Now a railway can help in the development of farming, ranching,

lumbering or industry or even Musk Ox farming on the Tundra, depending on the need and the amount of money that could be justified in nurturing and developing the same from a small nucleus and gradually expanding with the help of, among other things, cheap transportation such as a railway can provide. Unfortunately, however, such does not apply to mines whether precious or base metal. These cannot be developed from a small beginning to become a major producer, and the Precambrian Shield could be criss-crossed with a veritable network of railroads, and they would in no sense develop the Precambrian Shield, would not add one ton of ore to an ore deposit, nor place the deposit in a more convenient location for transportation. Base metal deposits like gold, are where you find them. They cannot be legislated into being nor coaxed into existence by the location of roads or railroads no matter how strategically located or how favourable the geological formations may be. The search for ore may be intensified and the methods of search improved with still no guarantee that this extra effort and expenditure will lead to the discovery of a new orebody, but this is not the field of the railroad; it is the field of the light aircraft and the helicopter. Even if a base metal orebody is discovered, the only function of the railroad is to exploit that orebody and a spur line to the mine is the only requirement. When the ore is exhausted the railway, along with the mining community, is abandoned. A spur line from the Grimshaw - Hay River railway would be sufficient to look after the transportation problems of Pine Point Mine. Supposing this mine has a life of say forty

years, which is perhaps above the average life span of a metal mine, it is to be hoped that in this forty years that section of the Canadian north lying between Grimshaw and Hay River and extending on down the Mackenzie River valley, will have developed into permanent agricultural, lumbering or industrial communities providing an equivalent or even greater volume of traffic to compensate for the 200,000 or more tons per annum which would be lost by the exhaustion of the Pine Point Mines.

The advocates for the eastern route have a point when they claim that a railway by this route will necessitate shorter spur lines to exploit any mine which may be found east of the Slave River; the claim that this railway would develop or speed up the development of that part of the Shield cannot be substantiated. However, routing the railway by this eastern route in the hope that some day perhaps it would be closer to an ore-body, if such were discovered, would be sacrificing the interests of some 8,000 people engaged in farming, together with a much greater number who could be farming and ranching on the some six million acres of potential arable land and the several millions of acres of potential ranchlands adjacent to the western route. Settlement developed along this western route would be permanent and could grow and exist for thousands of years whereas mines, be they ever so big, are a wasting asset, with a definite and comparatively short life. Since no such settlement can be looked for on the eastern route, neglecting the interests of the people and the developmental possibilities of the western route is a sacrifice too great to be made in the

nebulous hopes that some day an orebody may be found in the near vicinity of this eastern route and so justify this choice. In fact with a railway spur line to the eastern extremity of the Pine Point orebody, a railroad or even a truck road extension from that point would fulfil the transportation needs of any eventually discovered orebody to the east of the Slave River, with the limiting qualification that this orebody be discovered not too far east of the Slave River, and also that it should be a base metal orebody. Otherwise it could become more economical to extend a railway north from Lynn Lake. A few approximate distances might elucidate this point:

From Black Lake to Lynn Lake	290 miles
From Black Lake via Fort Smith to Waterways	535 miles
From Black Lake to Waterways via East Side of Athabasca River	270 miles
Uranium City to Lynn Lake	410 miles
Uranium City via Fort Smith to Waterways	420 miles
East End of Great Slave Lake - Lynn Lake	560 miles
East End of Great Slave Lake via Fort Smith-Waterways	510 miles

Now if the argument could be substantiated, as was advanced in favour of the eastern route, that railways will accelerate the development of the Precambrian Shield, then serious consideration should be given to the extension of a railway line from Lynn Lake. This extension would traverse Precambrian areas over its entire length and could be extended as far as Uranium City. This then narrows down the area of country which would benefit by a railway to Hay River via the

eastern route to that area lying east of the Slave River and within a radius of 150 - 200 miles more or less from Fort Smith. (Care must be exercised in considering distances as mere map miles; the terrain is all important and road and railroad construction in the Precambrian is very much most costly than an equal mileage in the Palaeozoic).

Various reasons were given to the Commission to explain the seeming non-productivity, minewise, of this interlake area east of the Slave River. It was maintained that it was "inaccessible", or "too far from cheap transportation", or "not at present in favour with geologists and exploration engineers". The last of these statements may be the true answer, and it may be true for some very logical reasons. The first two reasons can hardly be substantiated. Even in pre-aircraft days, this region was easy of access to prospectors, being open to established water routes on three sides and traversed by numerous canoe routes, lakes and waterways. A <u>marginal</u> orebody might suffer because of lack of cheap transportation, but certainly not <u>before</u> such marginal orebody is discovered, and nothing that could be termed marginal has so far been discovered in or in the near vicinity of this area. Not only is this area "not in favour with geologists", it is not favourable geologically. This area has been heavily glaciated; the outcrops are well exposed and can be prospected with ease. These outcrops consists of granites and granite gneisses with remnants of old sediments. The intrusion of granites, developing the tremendous heats and pressures required

to transform these sediments into gneissic rocks, would preclude chemically, not geologically, the survival of the more volatile metallics. Later intrusions of small basic dykes and younger granites have been responsible for minor occurrences of various minerals of academic or promoter interest, but it is on a fairly sound basis that geologists consider that this region is not favourable for the prospect of discovering sizeable metallic orebodies. It is significant that all but a few of the major ore deposits now known are in volcanic belts, the sedimentary gneisses having proved to be relatively non-productive. A casual study of the Geological Map of Canada will indicate how universally true this is of the entire Precambrian Shield area.

It may be labouring the subject unduly but a geologically similar area may be cited. The northern portion of the British Isles is also in the Precambrian and is underlain by a similar complex of granites and granite gneisses with literally hundreds of basic intrusives. This area has had adequate transportation in the shape of roads, canals and railways, and has been easy of access since 1745, but to date has produced no minerals except building stones, curling stones and tombstones.

To summarize, while it is not possible, and is even foolish to attempt to predict where the next orebody may or may not be discovered, logical deduction would indicate that

building the railway by the eastern route nullifies its function as a developmental railway, while substituting merely the gamble that it might be geographically closer to any orebody found in one rather small, not too favourable, region of the Precambrian Shield, with the added limiting condition that such an orebody must be base-metal in large tonnages.

THE SOCIOLOGICAL FACTOR

In the final analysis of all the factors that have to be considered in determining which route the railway should follow, the most important is the 'human' factor. The whole problem would seem to hinge on the question of whether the Government of Canada, using the money of the people of Canada, wishes to build a railway into new country to foster and develop settlement, a truly developmental railway, or to build a railway to exploit a mine and increase the earnings of already large corporations.

It is generally accepted and often quoted that it is the pioneering spirit of her people that has made Canada a great nation. This greatness had its beginning with the men and women who had pioneering spirit together with a 'love of the soil', which made them carve out homes for themselves in the places beyond the frontiers. Fortunately, these early pioneers were backed by railway builders who had a like pioneering spirit and were willing to push railways along the waggon trails of these early settlers, not waiting till they would be assured of a profit, but willing to gamble that the railway would ensure that

settlement and profits would follow, and follow in magnitude such that the railways would eventually be a paying venture. Invariably their gamble paid off, even if the sequence was the exact antithesis of the policy advocated so strongly by the proponents of the eastern route, who endeavour to prove that a railway on the western route would not have enough traffic to make it a profitable undertaking. This fact, though really not difficult to prove, was equally true of the early stages of practically every other railway except those built specifically to serve some industry or exploit a mine.

In 1929 the then Government of Canada were cognizant of the fact that all the pioneers had not become extinct, nor been absorbed by the large urban centres or big corporations, and that some of these people were endeavouring to open up a new section of the country to the north of Grimshaw and the Peace River. If the old concept were to hold good, and this new territory which will eventually reach down to the Arctic coast, was to be integrated as part of the Dominion, then a railway was a prime necessity. In 1929 therefore the Canadian Pacific Railway and the Canadian National Railway bought the Edmonton Dunvegan and British Columbia Railway and incorporated the Northern Alberta Railways. There is in the Dominion Statutes of 1929, an Act of Parliament ratifying, confirming and declaring to be legally binding the agreement between the Canadian Pacific Railway and the Canadian National Railway. The two companies agree to operate the new company, the Northern Alberta Railway, with due regard to the necessities of the territory to be served. The

new company was given the power to build an extension from Grimshaw to the northern boundary of the Province, to start within two years and to be completed within five years. In 1931 this time was extended for another 2 and 5 year period.

In spite of the fact that in 1917 the railway (Central Canada Railway Company) had carried their survey as far as the Meikle River, the Canadian Pacific Railway and the Canadian Northern Railway did not build one single mile of railway according to their 1929 agreement with the Government of Canada, and in 1959 we find the Northern Alberta Railway presenting a very strong (albeit a very inaccurate brief) to this Royal Commission, advocating that a railway be not built north from Grimshaw at all. One of the objections to this route was that it was more costly by reason of having to build extra railway stations along this route, the inference presumably being that the trains would have to stop and pick up grain or lumber and such commodities as are generally associated with people, homes, and permanent settlements. While from a railway point of view, extra stations may not be a good thing, it would seem to the layman that a route whereon, not three, but thirty-three or more extra stations were required, would be a good route.

The fact that this route does not mean sacrificing a profitable ore haul available at the northern extremity of the line, and the fact that settlers north of Grimshaw will be taxed in order to pay for this railway and possibly to meet a deficit for the first few years of operation, would seem to indicate that the concession they are asking for in having the railway routed through their settlements, is a not too selfish request.

ENGINEERING FACTORS

Engineering factors are of major importance in determining the most desirable route for a railway since these factors govern the cost of construction; the lower the costs of construction the more attractive are the tariff rates to the shipper and the rate of return on the investment.

The engineering factors governing the cost of construction which must be considered are:

1. Mileage of new construction.
2. Ease of accessibility.
3. Soil types and terrain.
4. Ballast.
5. Bridges.
6. Grades.

1. MILEAGE OF NEW CONSTRUCTION.

It is the unanimous opinion of all three members of this Commission that to provide access to and develop the Northwest Territories, the logical and desirable northern terminus of the railway, whether built along the eastern or western route, should be the harbour at Hay River town (See Chapter 9 - "Harbours"). Since this railway is to function primarily as a developmental railway the location of the trunk line is most important and access to present or future mines or to intermediate harbours or transshipment points should be thought of in terms of branch lines.

Considering first the western route, the trunk line would be built from Grimshaw to Hay River town, with an approximate

mileage of 398 miles. A spur line from the vicinity of the Alexandra Falls would serve the needs of Pine Point mine and would have a length of approximately 75 miles, the last 25 miles of which would traverse the length of the Pine Point orebody and would be useful for surface transportation in the mine operation. The total mileage of new construction would therefore be 473 miles. The mileage from Pine Point to Grimshaw would be 437 miles. A transhipment point would be established at Enterprise, 28 miles south of Hay River, to connect with truck service to Yellowknife, Fort Providence and Fort Simpson and as the highways are extended, down the Mackenzie Valley.

A trunk line on the Eastern route from Waterways to Hay River would have an overall distance of approximately 426 miles, a spur line to Fort Smith would be approximately 25 miles, while a spur line to Pine Point mine would be 32 miles. The total new construction by this route would be 483 miles. The mileage from Pine Point Mine to Waterways would be 418 miles but this would not provide any surface transportation at the mine, since the terminus would be towards the eastern end of the mine property.

Summing up then, it would appear that there is a matter of ten miles difference in favour of the Western route, though this statement must be qualified by saying that these mileages were arrived at by simply scaling off a map. They do, however give a basis for comparison.

TERRAIN - WESTERN ROUTE

The Department of Highways of Alberta has data[1] on its files with respect to the terrain to be traversed by a railway from Grimshaw to Hay River, having made very detailed studies and investigations of the same during the construction of the Mackenzie Highway.

In general the country is of low relief, in fact, quite flat, but not so much so as to present any serious drainage problems and with relatively few acres requiring heavy excavation.

TERRAIN - EASTERN ROUTE

A railway built from Waterways to Hay River would traverse terrain about which not too much is known, certainly no factual data such as is available for the western route. Evidence obtained from a perusal of the note books of the Dominion Land Surveyors who ran the base lines and meridians in the region tributary to the Athabasca River would indicate that most of this region is a sand hill country. The whole of this region is drained by subsequent streams flowing easterly towards the Athabasca River and since these streams are in the youthful stage, the valleys are deep and V-shaped and would require much bridging. The terrain west of Lac Clair is poorly drained, with extensive swamps which reach westerly almost to Jackfish River Post; the railway would have to make a wide detour to the west to avoid these swamps. From Peace Point to the vicinity of Fort Smith the country is flat with several minor marshy areas which could be

(1) Authority - Province of Alberta, Department of Highways.

circumvented at no greatly added cost. From Fort Smith to Pine Point, on the route proposed by the advocates of the eastern route, we have perhaps the most formidable swamps in the Northwest Territories, but perhaps the best wild fowl nesting grounds in Canada, the nesting grounds of the Whooping Crane, and while this may seem a trifling detail, our heritage in wild lifeshould be preserved if at all possible.

Construction across these swamps would be difficult and drainage an almost insurmountable problem. Actually Consolidated Mine and Smelting Company power line engineers in an earlier power-line survey declared that a power-line could not be established across these swamps from the falls at Fort Smith to Pine Point except at unreasonable expense. The "map-line" shown as the route of the railway, suggested in the railway brief, traverses this same region. By simply re-routing the railway along the escarpment which runs from the falls at Fort Smith to the Alexandra Falls, a slightly longer but infinitely better route would be found, and this is undoubtedly the route that would be decided upon by location engineers even at the cost of a little extra mileage.

ACCESSIBILITY - WESTERN ROUTE

Accessibility for the purposes of surveying, transportation of men and supplies, construction and maintenance are important factors in the cost of construction of a railway. The Mackenzie Highway would make any portion of a railway line from Grimshaw to Hay River very easy of assess by the simple expedient of having short access roads to the right of way. The railway line could be constructed in sections simultaneously along its whole

route and any delay in one particular section would not be reflected in another. This would, of course, be of the utmost importance if for any reason it was necessary to speed up the construction of the railway.

ACCESSIBILITY - EASTERN ROUTE

The eastern route on the other hand could be described as very difficult of access. The route reconnaissance and much of the primary surveys would have to be done in the winter time, more so if the railway line is to follow either of the routes proposed in submissions presented to the Commission, where the railway line is presumably crossing, if not impossible, at least most formidable swamps. However, though it is most unlikely that any railway would be constructed on anything but reasonably dry land or escarpments which would avoid the worst of these very extensive swamps, nevertheless the servicing of survey and construction camps would entail considerable expense. It would be necessary also, as soon as the actual route was decided upon, to build at least a winter road before any actual construction could take place.

SOIL TYPES - WESTERN ROUTE

In that section of the Mackenzie Highway which lies in Alberta, the soil type is generally similar to that found throughout the Western Prairies, which is very suitable for embankment and sub-grade purposes. In the Northwest Territories from the Alexandra Falls to Hay River the route of the Mackenzie Highway follows, for

the most part, ridges of coarse gravel. The 75 miles from the Alexandra Falls to Pine Point would follow the route of the present truck road which is located on old raised beaches, which largely avoid the swamp areas.

SOIL TYPES - EASTERN ROUTE

Except for a section of 75 miles between Peace Point and the crossing of the Little Buffalo River, which may be fair soil for railway construction, the soil types are presumably sands or tar sands and marsh, none of which are suitable for embankment work. Excavation of tar sands are extremely costly and due to their tendency to "creep", make for costly maintenance.

BALLAST - WESTERN ROUTE

Supplies of gravel were adequate during the construction of the Mackenzie Highway, but since railways prefer to train haul their gravel for ballast, it will be necessary to have access to gravel in large quantities. The railway gravel pit at Peace River has been in continual operation for twenty-five years and has immense reserves. Unfortunately, this gravel is in the valley of the Peace with a 2.2% grade out of the valley, against north-bound traffic and it may not be too desirable to use this deposit. However, there is a very large deposit of gravel just east of North Star which is available and a still larger deposit on the west side of the Peace River near Carcajou. Between the Alexandra Falls and Hay River the sub-soil is mostly a coarse gravel.

BALLAST - EASTERN ROUTE

Sufficient reconnaissance has not been made on the eastern route to determine where gravel may be found. Railway construction from Lac La Biche to Waterways was very heavy construction and very costly construction through extensive muskeg and sand areas, through terrain very similar to much of the terrain extending north from Waterways.

BRIDGES - WESTERN ROUTE

On the western route bridges are not required to cross the Peace or the Athabasca. The only valley of any consequence to be crossed is that of the Third Battle or the Meikle River, this latter being a very small stream with a youthful valley approximately 150 feet deep. The Notikewin, the Keg, the Boyer, the Hay and the Steen rivers have no river valleys and are relatively narrow streams with no high banks. The Mackenzie Highway was constructed with very minor bridges across these streams.

BRIDGES - EASTERN ROUTE

A railway following the eastern route has to cross two major rivers, the Athabasca and the Peace. The bridging of the Athabasca would merely be expensive but no great engineering difficulties are anticipated and if the crossing were made at Fort McMurray there are no high banks. It is proposed to cross the Peace River at Peace Point. It is not known whether the threat of "slide conditions" prevail at this point on the Peace River valley. Very

large sums of money have been spent at the Peace River and Dunvegan crossings to stabilize the river banks. Reconnaissance surveys of the entire Peace River valley have been carried out by the Alberta Department of Highways and indications are that the same slide conditions exist throughout the whole Peace River valley at least as far as the Boyer Rapids. Actual drilling tests however will be necessary to determine whether the Bentonite beds, which are largely responsible for these slide conditions, are present at Peace Point,

If the proposed railway route closely follows the Athabasca many minor bridges will be required, not because of the size of the streams but because of the deep V-shaped valleys so developed by even small streams as they cut through the sandy soil. After leaving the Athabasca Valley, aside from the Peace River crossing, no major bridging difficulties should be encountered since the streams have lost their gradient and are no longer developing river valleys. A bridge will be necessary to cross the Hay River, either at the town of Hay River or at the Alexandra Falls, at either of which crossings bridging will be easy.

In private conversations with railway engineers and superintendents who have had a long practical experience with the Northern Alberta Railways the suggestion was put forward that a railway route starting south of Waterways, crossing the Clearwater River and continuing north on the east side of the Athabasca for approximately one hundred miles and then crossing the Athabasca River and proceedings from thence northward to Peace Point would have much to recommend it. It would mean weighing the added cost of the bridging of the Clearwater against the very costly tar sands

excavation for seventy miles on the west side of the Athabasca but with the advantage of much more suitable terrain on the east side of the Athabasca together with a lesser number of small bridges, since the drainage pattern on the east side of the river is quite different from that on the west side. While this matter was not brought up in the evidence it is a route that has considerable merit, more so if at a later date a railway to the east end of Lake Athabasca came under consideration. It would also ameliorate the pusher grade just south of Waterways.

GRADES - WESTERN ROUTE

Statements were made to the Commission that "the eastern route has easier grades than the western route", a statement which bears no relation to the facts of the case. Let us consider first the gradients on the western route from Edmonton to Grimshaw. Here we have an already constructed railway from Edmonton Junction to Grimshaw, a distance of 327 miles, having a ruling grade[1] of 0.5% throughout its length, with the exception of an eight-mile section of excessive adverse pusher grade[2] ascending the west side of the

1. Ruling Grade Webb's "Railroad Construction". "Ruling grades are those which limit the weight of the train of cars which may be hauled by one engine". (page 611).

2. Pusher Grade Webb's "Railroad Construction". On nearly all roads there are some grades which are greatly in excess of the general average rate of grade, and these heavy grades cannot usually be materially reduced without an expenditure which is excessive and beyond the financial capacity of the road. Two methods are used to overcome such grades: (a) a 'pusher' engine is used to push the train up the grade, or (b) a siding is installed and the cars pulled up in relays. (page 614).

Peace River valley, consisting of a mixture of 1.9%, 2% and 2.2% grades against the north bound traffic. From the top of the hill at Roma Station a 0.5% ruling grade again prevails.

In the year 1917 a survey was carried out by the Central Canada Railway Company from a point where Grimshaw is now located for a distance of approximately seventy miles northerly to a point near the Meikle River. This survey established that a ruling grade of 0.5% was entirely feasible. Profiles of the Mackenzie Highway filed with the Alberta Department of Highways would entirely justify the assumption that a ruling grade of 0.5% would be obtainable over the entire route from Grimshaw to Hay River. On south bound traffic there is an adverse pusher grade of 2.4% for seven miles from Peace River south. This is unquestionably an operational disadvantage which has to be met by employing a pusher locomotive or by breaking train and re-laying up in sections, but the additional costs involved are comparatively small when weighed against the overwhelming advantage of a 0.5% ruling grade over the remaining 707 miles of railway.

GRADES - EASTERN ROUTE

Turning now to the eastern route, we have an already existing railway from Edmonton Junction to Waterways, a distance of 305 miles, with a ruling grade of 1% against <u>both</u> north bound and south bound traffic, <u>not</u> as stated in the evidence against north bound traffic only[1]. Now it is axiomatic in railway construction

1. Transcript page 1136.

that "when a ruling grade has been determined, all grades in either direction are cut down to that limit"[1] and also "no added expense should be incurred to reduce grades below that pre-determined ruling grade". Therefore, if the railway were built north from McMurray, it would be advisable to continue on a 1% ruling grade in order to reduce costs, especially along the tar sand exposures which extend some 70 miles north of McMurray.

Considering these facts it is hard to reconcile the statements advocated by both the railways and by the Edmonton Chamber of Commerce that "the eastern route would have easier grades". It must be noted that there is from Draper to Lynton a section of pusher grade of 2% adverse to south bound traffic, similar to that at the Peace River valley and differing only in degree.

Keeping in mind the long accepted principle of railway operation[2] that a railway having a ruling grade of 0.5% can haul from 60% to 70% more tonnage per train than can be hauled by a similar train over a route having a ruling grade of 1%[3]; or in other words, for a fixed amount of tonnage and using the same type of locomotive the railway with the 0.5% ruling grade would require five trains to move the tonnage, whereas the railway with the 1% grade would require eight trains to move the same tonnage.

In terms of added cost of operation to the railway, supposing that 105 trains per year were necessary to haul the 215,000 tons of ore from Pine Point to Edmonton via the western

1. Webb's Railroad Construction, page 620.
2. Webb's Railroad Construction, pages 299-311.
3. Webb's Railroad Construction, page 620.

route, then 168 trains would be required to haul this same amount of ore to Edmonton via the eastern route.

Using the mileage figures heretofore quoted, of 437 miles from Pine Point to Grimshaw plus a distance of 329 miles from Grimshaw to Edmonton Junction, we have an ore-haul distance of 766 miles or a total of 1532 train miles. Assuming that $6.50 would be a reasonable cost per train-mile then the cost of transporting 215,000 tons of ore by the western route would be -

1532 train-miles x $6.50 per train-mile x 105 trains

--- $1,055,548.00

On the eastern route the mileage from Pine Point to Waterways of 418 miles plus 305 miles from Waterways to Edmonton gives a total distance of 723 miles or a train-mile distance of 1446. The operational cost of hauling the same 215,000 tons of ore by this eastern route would be -

1446 train-miles x $6.50 per train mile x 168

--- $1,579,032.00

Therefore on an operating basis the railway could expect to save $523,484.00 per annum on an ore haul from Pine Point using the western route via Grimshaw.

Taking this figure in conjunction with the revenue expected, on the western route the revenue might be 766 x 1.6¢ x 215,000 -- $2,635,040.00. On the eastern route this would be 723 x 1.6 x 215,000 -- $2,487,120.00. The extra revenue to the railway by following the western route would therefore be $147,920.00 which, together with the cheaper cost of operating on the western route, would mean that the railways would gain annually an amount of

$671,404.00 by having the railway built on the western route. Even though the figure of $6.50 taken as the cost per train-mile and 1.6 cents per ton mile as the rate for an ore haul, are arbitrary figures, possibly close assumptions, the comparison is still valid.

In view of these figures it is very hard to reconcile the statement made by the railways that "operating costs per unit of traffic would be lower on the Waterways route"[1].

COSTS OF CONSTRUCTION AND MAINTENANCE

COST OF CONSTRUCTION - WESTERN ROUTE

Considering the advantages cost-wise that accrue from ease of access and terrain, it is to be expected that the cost of construction on the western route would be much the cheaper of the two.[2] The Commission has been informed in private communications by competent engineers who have had actual "on the ground" experience that the western route undoubtedly will be much less costly to build and, as one engineer expressed it, "not much different from building any place else on the Prairies". It is felt that these opinions are much more valid than the evidence given by several witnesses who had "flown over the proposed route". However, using the cost-per mile figure given by Major Charles, based on 1957 prices, of $138,000.00 per mile, the western route with a spur line to Pine Point would be (473 x 138,000.00) $65,274,000.00 plus the cost of perhaps three additional stations.

1. Transcript page 1139.
2. Transcript pages 2895-96.

COST OF CONSTRUCTION - EASTERN ROUTE

Basing the costs again on $138,000.00 per mile, the cost of construction on the eastern route, with branch lines to Fort Smith and to Pine Point would be (483 x $138,000.00) $66,654,000.00. But without a preliminary survey of the route it is hard to estimate how much more than this it may cost. In addition to this we have two major bridges which could cost $8,500,000.00, which would bring the total cost of construction to $75,154,000.00. There would be a slight saving in not having to reduce ruling grades beyond McMurray to less than 1% and in fewer stations being required, but these savings would not offset to any large extent the disadvantages of access and terrain.

It must be borne in mind that prices have advanced considerably since 1957 in both labour and materials, and while these costs are comparative, they could well be quite wide of the mark. Unfortunately they cannot beexpected to be lower.

Summing up the engineering factors therefore, it appears that the western route has on every aspect a distinct advantage over the eastern route from Waterways.

TABLE I

CURRENT AND FUTURE RATES - EDMONTON - YELLOWKNIFE AND EDMONTON - FORT NORMAN

CURRENT RATES EDMONTON - YELLOWKNIFE

Rail	Class 45	Carload Lots
Barge	Class 5	Carload Lots
Truck	Class 4	Truckload Lots

TRANSPORTATION	DISTANCE (Miles)			RATES (¢/100 lbs.)			
	Rail	Water	Total	Rail	Water	Total	
RAIL AND BARGE							
via Waterways	305	581	886	107	175	282	
	Road	Water	Total	Road	Water	Total	
HIGHWAY AND BARGE							
via Grimshaw - Hay River	702*	126	828	258	110	368	
Highway - Winter Rate	931*			468		468	- Rate based on summer rate of $2.58 per 100 lbs, plus $2.10 per 100 lbs.

FUTURE RATES - EDMONTON/YELLOWKNIFE

Based on current rate structure

	Rail	Water	Total	Rail	Water	Total
RAIL AND BARGE						
via Fort Smith	615*	263	878	166	100	266
via Grimshaw-Hay River	710*	126	836	186	75	261

FUTURE COMPETITIVE RATES - EDMONTON/YELLOWKNIFE

	Road	Water	Total	Road	Water	Total	
HIGHWAY AND BARGE							
via Grimshaw - Hay River	702*	126	828	186	110	296	- Assumes 35¢ per 100 lbs. handling charges.
Highway - Winter Rate via Enterprise	936*	(674 miles to Enterprise)		176-210		386	- Rate based on Class 45 carload rate to Enterprise plus $2.10 per 100 lbs.

CURRENT RATES - EDMONTON - FORT NORMAN

	Rail	Water	Total	Rail	Water	Total
RAIL AND BARGE						
via Waterways	305	1108	1413	1.07	2.60	3.67
	Road	Water	Total	Road	Water	Total
HIGHWAY AND BARGE						
via Grimshaw-Hay River	702*	540	1242	2.58	1.68	4.26

FUTURE RATES - EDMONTON - FORT NORMAN

	Rail	Water	Total	Rail	Water	Total
RAIL AND BARGE						
via Fort Smith	615*	790	1405	1.66	2.00	3.66
RAIL AND BARGE						
via Hay River	710*	540	1250	1.86	1.68	3.54
(or highway)						

* Estimated Mileages

Tariff Authority

C.P.R. W. 1000; C.T.C. W.4204

Northern Transportation Co. Ltd.
General Freight Tariff; C.T.C. No. 44

REPORT

OF THE

ROYAL COMMISSION

ON THE

GREAT SLAVE LAKE RAILWAY

VOLUME II

ROYAL COMMISSION ON THE RAILWAY TO GREAT SLAVE LAKE

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OF THE

R O Y A L C O M M I S S I O N

ON THE

G R E A T S L A V E L A K E R A I L W A Y

VOLUME II

FACTUAL AND STATISTICAL MATERIAL

Volume I published earlier, contains the reports of the Commissioners. Volume II contains factual and statistical material that is considered relevant to a choice of route for a railway.

JULY 1960

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LIST OF TABLES

LIST OF CHARTS AND MAPS

CHAPTER VI

AGRICULTURAL RESOURCES

The existing size of farm settlement and production along a proposed westerly route has already developed far beyond anything evident along an easterly route. This is not to say that no agricultural potential exists along the latter route - a matter which will be dealt with later. In terms of present development, however, no commercial agriculture exists along a proposed rail route north of Waterways. Tables II and III provide some sketchy evidence of the existing extent of farm settlement, production and grain shipments within the settled region north of Grimshaw and extending as far north and east as Fort Vermilion generally along the Mackenzie Highway and Peace River.

Total cereal grain shipments ex Grimshaw (wheat, oats, barley, flax and rye) over the past ten years have averaged some 1,733,000 bushels annually. This figure, when converted to a weighted average tonnage basis yields a figure of some 45,000 tons of grain annually. It is estimated that something less than 80% of this movement or some 36,000 tons originates in districts north of Grimshaw which would otherwise be served by any rail extension north of Grimshaw. At the present time, the great weight (about 90%) of productions and shipments originating north of Grimshaw is concentrated

TABLE II

ESTIMATED PRODUCTION OF CEREAL GRAINS NORTH OF TOWNSHIP 89 IN ALBERTA (MANNING TO FORT VERMILION REGIONS); AND TOTAL RAIL SHIPMENTS OF CEREAL GRAINS EX. GRIMSHAW, ALBERTA

	Estimated Production '000 bushels					Shipments ex. Grimshaw '000 bushels					Shipments ex. Grimshaw approx. tonnages	
Crop Year Ending	Wheat	Oats	Barley	Flax Seed	Total	Wheat	Oats	Barley	Flax & Rye	Total	Total Ex. Grimshaw	Originating North of Twp. 89 @ 80%
1950	461	271	63	30	795	1897	772	117	0	2,786	72,070	57,656
1951	680	498	162	41	1,381	1011	249	76	12	1,348	36,474	29,179
1952	696	429	149	160	1,434	1001	415	174	60	1,650	42,526	34,021
1953	882	751	345	200	2,178	1015	594	305	154	2,068	51,586	41,269
1954	604	582	349	190	1,725	916	527	467	216	2,126	53,168	42,534
1955	365	448	234	195	1,242	980	244	622	187	2,033	53,468	42,774
1956	553	746	508	329	2,136	821	86	287	248	1,442	39,838	31,870
1957	562	808	580	315	2,265	961	90	234	186	1,471	41,094	32,875
1958	280	459	441	304	1,484	960	193	243	138	1,534	41,584	33,267
1959	505	856	819	528	2,708	372	86	330	88	876	22,920	18,336
											10 yr.av. 45,473	10 yr.av. 36,380

Source: Government of Alberta
Department of Agriculture
Edmonton, Alberta

Source: Submission by
Northern Alberta
Railways
Edmonton, Alberta

TABLE III

Statistics of Agriculture North of Township 89
(Census Division #17), Peace River Region, 1931 to 1956.

		1931	1936	1941	1946	1951
Occupied Farm Land	Ac.	72,053	122,293	144,874	155,848	156,982
Improved Land	"	14,734	33,902	60,283	79,098	93,965
Land Under Crop	"	10,742	24,477	39,657	57,307	63,391
Wheat	"	5,699	13,709	23,311	33,395	30,315
Oats	"	3,491	7,400	10,605	15,281	12,198
Barley	"	201	521	1,438	1,741	5,656
Flax Seed	"	N.A.	13	2,191	1,787	4,184
Hay & Seed Crop	"	150	569	778	3,026	9,900
Pasture	"	233	1,240	2,358	2,034	2,780
Summerfallow	"	2,281	6,453	15,478	18,573	25,391
Horses	No.	1,927	2,265	2,973	2,375	741
Cattle	"	1,917	4,146	4,199	4,510	1,976
Sheep	"	81	274	401	995	248
Hogs	"	1,723	2,838	6,501	2,786	1,675
Hens & Chickens	"	10,096	19,677	32,286	28,183	20,628

Note: Comparable figures for the Census year 1956 are not available due to a change in Census Division boundaries in that year.

Source: Alberta Government Department of Agriculture, Agricultural Extension Service.

in the region of Manning some 55 miles north. On the basis of the existing (statutory) freight rate applicable on grain movements beyond Grimshaw destined for export, such shipments can be expected to move to Grimshaw at about 1/2¢ per ton mile. On 36,000 tons of grain over a weighted average haul of 65 miles to Grimshaw, the rail carrier might expect to receive some $12,000. of incremental revenue for the south-bound grain haul to Grimshaw. Livestock tonnages presently moving by rail out of Grimshaw are small, being less than 2,000 tons annually in recent years. This figure reflects the effectiveness of truck competition in the movement of livestock over a system of well developed trunk highways.

In terms of a further physical potential for agriculture in either the northwest or northeast of the Province of Alberta, authoritative information is more sketchy - and somewhat more so to the east than to the west. Along with climatic data, the general soil and topographic type of reconnaissance provides the only reliable source of preliminary information concerning the physical potential for agriculture along either an easterly or westerly rail route over lands not already occupied. Such studies are being carried out by the Alberta Research Council, and the results to date are more complete for the northwesterly portion of the Province than is the case for the northeast section. The results of this helicopter reconnaissance program as of this date have been made

available to the Commission and are reproduced in the accompanying map (See Map No: III).

In addition to the Research Council work, one other major soils and topographic reconnaissance of relevance here has been carried out over the Slave River lowlands north of the Alberta boundary from Fort Smith to the Slave River delta. The summary indications of this survey are also set out in the aforementioned tables and map.

The soil and topographical reconnaissance carried out in the Slave River lowland stretching from Fort Smith northward to the Slave River delta indicates some 400,000 acres to be arable without topographical or serious fertility limitation. In addition, about 1,300,000 acres are said to be arable "with some or moderate limitations." These limitations include such physical and fertility limitations as imperfect drainage, slowness to warming, low moisture holding capacity, influence of permafrost, raw organic matter, coarse texture and low organic matter and nitrogen. The remaining portion of the roughly 2,000,000 acres reconnoitered is said definitely to be rendered non-arable by reason of steep slopes, stoniness, flooding, inadequate drainage and ponding.

The northeast section of Alberta south from the 60th parallel (N.W.T. boundary) to an east-west line some 25 miles north of Waterways has not yet been reported on in terms of the helicopter program of soil and topographical surveys currently being carried on by the Research Council of Alberta

over all of north central Alberta. Results of this survey program covering much of the rest of northern Alberta north of the 55th parallel are at present available, however. The coarse land-classification resulting from these studies is reproduced on Map No. III.

It will be observed that the surveyed region of northeast Alberta generally falling between the 55th parallel just north of Lac la Biche and the 57th parallel north of Waterways is classified as being practically devoid of any arable potential for agriculture. In the presently unreported region north of the 57th parallel to the Alberta border, the arable potential is not likely to be greatly different from that generally indicated over the region surrounding and to the south of Waterways. This is so by reason of the increasingly poor drainage and lower elevations present throughout the whole region encompassing the lower reaches of the Athabasca and Peace Rivers and the upper reaches of the Slave River. Moreover, a type of agriculture based on a livestock grazing economy is not likely to prove possible on the meadowland stretches as long as these are inhabitated in strength by the wood buffalo of the Park. Hence, the agricultural potential contiguous to an easterly route even in the long run is likely to be limited in extent to some half to one million acres along the lower reaches of the Slave River north of Fort Smith and suitable for a combined coarse grain - livestock feeding type of farm enterprise located in suitable

isolated patches of the river lowlands.

In contrast to the northeasterly sections of the Province, a wider coverage of the northwest portion of Alberta has been reported on as a result of the helicopter soil and land reconnaissance surveys already mentioned. Tables II and III and the associated map indicate the nature and extent of the land classification for each mapping block. The classification has been defined in terms of three groups, viz:

1. potentially arable (by reason of generally unlimiting soil, drainage, cover and topographical features.)
2. doubtful arable (by reason of indicated limitations imposed by one or several of the factors mentioned earlier.)
3. pasture and woodland (considered distinctly unsuitable for agriculture development.)

It is evident from these figures and from what is known of areas of existing settlement that some 5 million acres of "potentially arable" unoccupied land is available in the surveyed Peace River section of Alberta between latitudes 56° and 59° and west of the fifth meridian to the Alberta - B. C. boundary. These figures exclude the presently unreported strips some twelve townships deep just south of the Alberta - N. W. T. boundary. It is also to be noted, however, that

something over a third of this potential exists on the east and southeasterly side of the Peace River stretching from the vicinity of Falher and Peace River town on the south to Fort Vermilion and Vermilion Chutes on the north. This region is at present served hardly at all by transportation facilities of any kind, and this situation will not be greatly improved by the location of a railroad on the west side of the river. Nevertheless it is quite evident that the sheer arability potential of the whole region north of Grimshaw is considerably greater by a factor of at least 10 or more than anything indicated over the northeast portion of Alberta and north of the Slave River delta. Within the latter region, there is evidence of an arable potential with mild to moderate limitations in the middle reaches of the Slave River lowland of about 1-1/2 million acres, about a quarter of which is estimated to possess no general limitations on arability. On the basis of existing knowledge, therefore, it is clear that the north-west portion of the Province carries a vastly greater untapped agriculture resource than is the case to the northeast.

From the more immediate standpoint of railway routing and traffic development, it is now a question of how rapidly and in what way is this agriculture potential likely to be developed in the future. There is no doubt but that a continued expansion of improved acreage on presently occupied

lands will continue as in the past - with or without a railroad. The rate at which this trend can continue will depend in large measure on the future net income position of farmers and hence their ability to finance additional clearing and breaking of land - one form of farm capital accumulation. Cash incomes of present or potential grain shippers north of Grimshaw can be expected to increase to the extent of the savings provided on a grain haul to Grimshaw by rail rather than by truck as at present. This differential is estimated elsewhere in this report at around 7¢ per ton mile (1/2¢ per ton mile by rail for export as against 7-1/2¢ per ton mile by truck.) This could mean an annual cash saving to a typical farm shipping some 36 tons or about 1400 bushels in, say, the Manning district (55 miles) of about $140. per year. This amount is then available to provide either a higher level of farm living, or an increased rate of farm capital accumulation in one form or another.

There is little evidence to suggest that present or future livestock shippers would find it economical to make extensive use of a new rail extension in preference to trucking over the Mackenzie Highway and south with the exception perhaps of carload shipments of hogs. Even here, the ton-mile rate differential between rail and truck is small compared to that applicable on grain movement.

It is therefore anticipated that some growth will

continue to take place in the farming communities of the north Peace River district even in the absence of a railroad. Such growth will continue not so much by reason of new settlement as by new acreage brought under cultivation on presently occupied farms. And some new settlement will proceed in any event quite regardless of economic incentives or disincentives. However, the financial obstacles facing existing and new settlers in breaking out new land should be noticeably reduced with the advent of a railroad and considerably cheaper transportation costs on cereal grains particularly. This effect will be particularly noticeable in the more sparsely settled farming districts well north of Manning because of the trucking distances now involved. These are the districts (Keg River, High Level, Paddle Prairie) where acreage improvements and new settlement are likely to receive the greatest stimulus from the economic effects of railroad proximity.

In addition, it is anticipated that the greater freight savings offered on grain than on other farm products by rail versus truck carriers will lead to some alteration in the pattern of farm production - and again particularly in the more northerly farm districts. There is little doubt but that the advent of a railroad would provide rather suddenly a stronger economic incentive than at present towards the production of cereal grains for cash cropping

purposes and away from the small seed, forage and livestock enterprises.

Taken together, continued growth in cultivated acreage north of Grimshaw, together with some reallocation of acreage to cereal grain cropping should lead to a steady increase in the amount of grain traffic which can be anticipated by the railroads in the future over present levels.

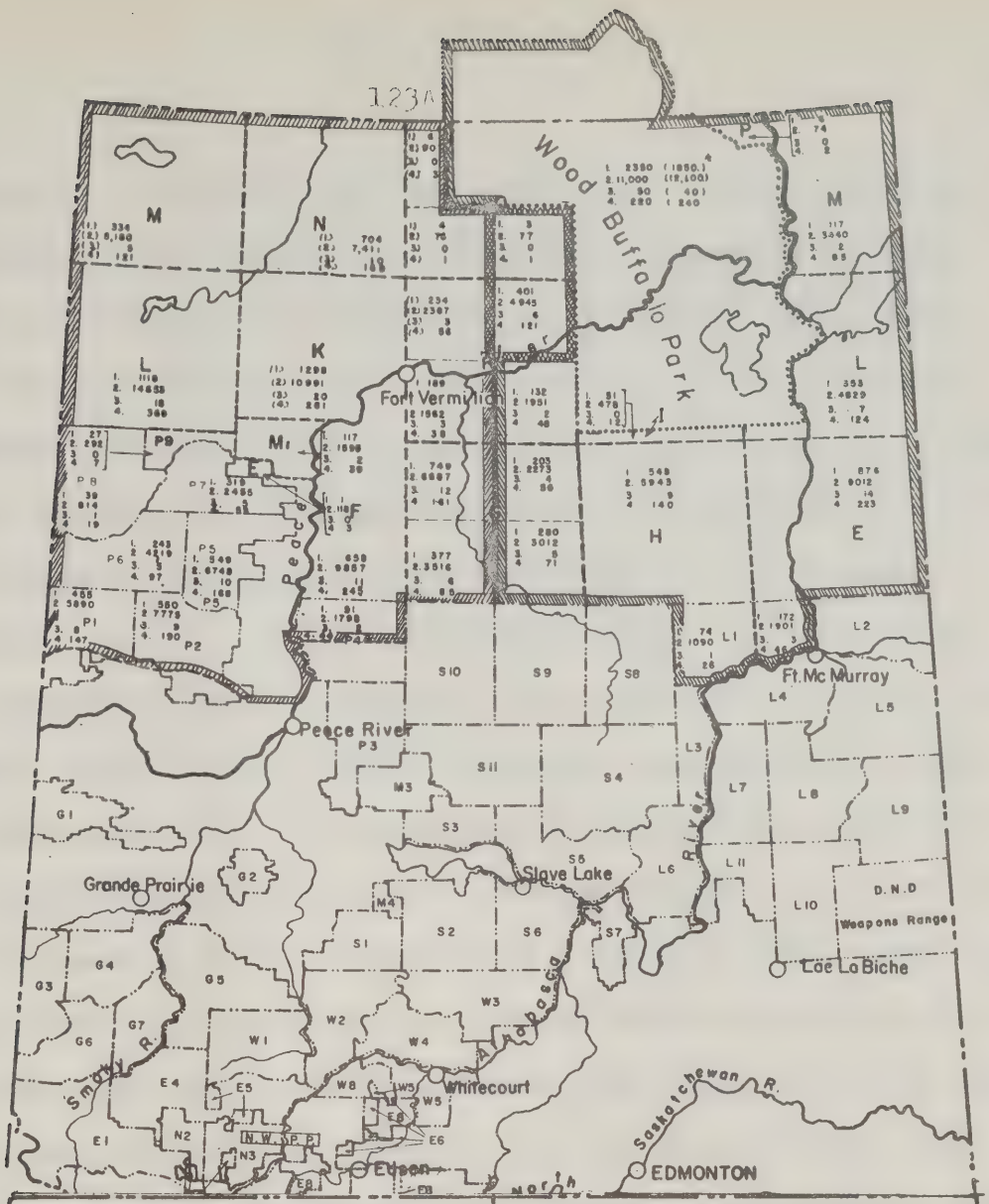
Within several years after commencement of railroad services, average annual grain shipments out of the whole region north of Grimshaw might well be expected to increase from the present estimate of 36,000 tons to nearly 50,000 tons annually. Thereafter, some increases in average tonnages due to a gradual growth in cultivated acreage can certainly be expected. It is estimated that grain shipments out of the region might well reach 100,000 tons within the next 20 years on the basis of both kinds of effects mentioned above. At such a time, the average length of haul over the new line will be closer to 100 miles rather than the present 65 miles due to the weight of settlement and production having moved north gradually. On the basis of a rail rate of 1/2¢ per ton mile on grain for export, the estimated 100,000 tons moving over an average haul of 100 miles would yield an additional $50,000. of revenue to the rail company on the new extension, in contrast to an estimated $12,000. - $16,000. as of the first few years of operation.

CHAPTER VII

FOREST RESOURCES

Some differences of opinion were evident during the hearings before the Commission with regard to the evidence concerning the extent of timber reserves contiguous to the proposed easterly and westerly rail routes to Great Slave Lake. It does not seem necessary to reproduce here all the details of the evidence submitted in this connection, since most of the apparent differences were found to hinge on matters of boundary, inventory, and rotation definitions. All parties submitting evidence produced figures which in any event were drawn from two basic sources, viz. inventory and annual allowable cut figures supplied by the Department of Lands and Forests, Government of Alberta, and comparable figures supplied for Wood Buffalo Park by the Forestry Division, Department of Northern Affairs, Government of Canada.

Using these same sources and tabulations prepared especially for the use of the Commission by the Alberta Government, Department of Lands and Forests, the Commission has attempted to summarize in Table IV two sets of data classified by inventory mapping blocks and where appropriate by smaller forestry management units. The comparable federal figures for the Wood Buffalo Park cannot be so classified by smaller geographic units, and are available only for the Park as a whole. The two sets of data considered to be most relevant for the purposes of evaluating future productive



West Route. Timber Resources.

Area.	Potential. (1) Saw Logs Millions F.B.M.	(2) Pulp Thousands Cords	Annual Allowable Cut.xx (3) Saw Logs Millions F.B.M.	(4) Pulp Thousands Cords.
M	334	5180	5	121
N	704	7411	10	169
O nw	6	90	0	3
O sw	4	76	0	1
O se x	3	77	0	1
J nw	234	2387	3	56
J ne x	401	4945	6	121
J sw	189	1562	3	38
K	1298	10991	20	261
L	1118	14653	18	369
E ne	1	118	0	3
P8	39	814	1	19
P9	27	292	0	7
P7	319	2455	5	59
M1	117	1595	2	39
F	658	9857	11	245
G nw	749	6687	12	161
G sw	377	3516	6	85
P4	91	1798	2	44
P5	549	6748	10	168
P6	243	4219	5	97
P1	455	5890	8	147
P2	550	7775	9	189
	8466	99136	136	2404

x. Common to both routes.

xx. Average rotation for saw timber = 62 years
Average rotation for pulpwoods = 41 years

LEGEND. AREA AVAILABLE TO WEST ROUTE
" " " EAST ROUTE
" COMMON TO BOTH ROUTES

TIMBER RESOURCES (EAST ROUTE)

Area	Potential (1) Sawlogs Millions F/B/M	(2) Pulpwood Thousands Cords	Annual Allowable Cut (3) Sawlogs Millions F/B/M	(4) Pulpwood Thousands Cords
L1	74	1090	1	26
L2	172	1901	3	46
H	548	5943	9	140
E	876	9012	14	223
I	51	478	0	12
L	353	4829	7	124
M	117	3440	2	85
P	6	74	0	2
J s-e	132	1951	2	48
C s-e	3	77	0	1
J n-e	401	4945	6	121
C n-e	203	2273	4	56
G s-e	280 x	3012 x	5 a	71 b
W.B.P.	2350 (1850)	11000 (12100)	50 (40)	220 (240)
Total	5566 (5066) x	50025 (51125) x	103 (93) x	1175 (1195) x

x. Converting 500 million f/b/m of Hardwood Sawlogs to Pulpwood equivalent, to be consistent with the Province of Alberta's inventory classification.

a. Average rotation in Wood Buffalo Park for saw timber taken as 47 years.

b. For Pulpwoods as 50 years.

5.29 f/b/m = 1 cubic foot; 85 cu. feet = 1 cord

Green dressed lumber = 2100 lbs per M.F/B/M
Carload of Lumber = 30,000 F/B/M = 32.5 tons approx.

TABLE IV
TIMBER RESOURCES OF NORTHERN ALBERTA

potential in forestry are those relating to the standing inventory of saw timber and pulpwood by geographic unit, and those relating to estimates of the net (after allowance for anticipated fire losses) annual allowable cut of saw timber and pulpwood by geographic unit based on the age, specie and density characteristics of the standing inventory. The method of conversion from an inventory to an annual cut basis in the case of the provincial figure is that which involves Von Mantel's formula. The combined provincial and federal (Wood Buffalo Park) data have been separated into two groups in Table IV according to whether the inventory and annual cut figures apply to areas thought to be exploitable at some stage as a result of a railway being constructed along either an easterly or westerly route traversing northern Alberta. The map which accompanies the data indicates the geographic allocations made as well as the inventory and annual cut figures applicable to each mapping region. The designation of exploitable forest reserves as potential development and traffic accruing to one route or another is of course somewhat arbitrary on the fringes. Commercial operations in some central areas may also be rendered more feasible regardless of which route is chosen just so long as rail service is somewhat extended to more northerly regions beyond present rail head. Hence some areas may be thought of as being common to both projected routes. All of these possibilities are indicated on the map.

It should also be noted that the provincial inventory of timber volumes makes no attempt to classify poplar stands by specie or by size of tree, and hence all poplar is classified as saw timber suitable for peeler (plywood) logs. Such a distinction is ordinarily of limited usefulness except with respect to limited and isolated stands of good quality large black poplar most commonly found along the river flats. The federal figures for the Wood Buffalo Park do set out volumes of hardwood species of a size suitable for peeler purposes along with volumes of softwood saw timber. In Table IV, this classification has been maintained for the Park in the main set of figures where the volume and annual allowable cut of saw timber are set out as 2,350 and 50 million f.b.m. respectively. These estimates include then both hardwood and softwood species of a size suitable for saw timber. In the interests of consistency with data for the rest of the Province, however, the hardwoods portion of the saw timber volume and cut for the Park have been removed, converted to a cord measure basis, and added to the pulpwood volume and cut for the Park.

It is also to be noted that the use of Von Mantel's formula for the estimation of an annual allowable cut from the inventory volume figure is based on the assumption of a "normal" age distribution in the inventory as well as the application in the formula of given rotational ages

for the various contained species. On this basis, the average implicit rotational ages (expected age to maturity divided by two) or ratios of volume to annual cut in the provincial data are approximately 62 years and 40 years for saw timber (excludes hardwoods) and pulpwood respectively. The comparable ratios for the Wood Buffalo Park are 47 years for saw timber (includes hardwoods) and 50 years for pulpwood. With regard to saw timber for instance, one implication of these apparent discrepancies is that a given standing volume of timber in the Wood Buffalo Park is capable of producing a proportionately higher annual allowable cut than is generally true elsewhere within the Province. Such a result is theoretically possible over a certain period of time where the standing volume contains an unusually or "abnormally" high proportion of mature and/or over mature timber. There is much evidence to support the contention that such is in fact the case over much of the most heavily forested stretches of the Wood Buffalo Park. Indeed, these are the grounds on which commercial lumbering operations have already been licensed within the Park by Park authorities. Although the exact extent of the age distortion applicable to the forest resources of the Wood Buffalo Park is difficult to verify, the Commission is nevertheless disposed to accept the reasonableness of a somewhat higher annual cut to volume ratio for the Wood

Buffalo Park than is generally applicable on the average over the other regions dealt with in the Province.

On the basis of the above remarks the totals indicated in Table IV for saw timber and pulpwood summarize the total and annual forestry potential available for development and roughly adjacent to the two proposed rail routes. It will be noted that the totals suggest an annual availability of saw timber of somewhere between 30% - 50% greater to a westerly route than to an easterly one. In the case of pulpwood, potential availability to the westerly route is nearly 100% greater than to the easterly route.

It is recognized that the overall results indicated by Table IV must be accepted as approximations only - and in particular with regard to the allocations of the potential of any one mapping region to one or the other of the proposed rail routes. It is also recognized that the proportion of softwoods - hardwoods is generally higher in regions adjacent to the easterly route than is true of the west, and that accordingly the suitability of timber stands for both lumber and pulping is likely to be superior to the east. On the basis of the data presented however, this factor is not sufficiently potent to compensate for the greater density of all species indicated for the more westerly regions. It is therefore concluded that the

developmental potential for the forestry industry in both saw timber and particularly pulping material is substantially greater in the central and north-westerly portions of the Province than is the case in the central and north-easterly regions.

CHAPTER VIII

MINERAL RESOURCES

The Pine Point orebody, situated approximately 45 miles east of Hay River town, and 10 miles south of the south shore of Great Slave Lake, is the only mineral deposit presently known in the Canadian northwest which will provide an ore haul for the new railway. Since the ore from Pine Point is destined for the smelter at Trail, and not to a seaboard point, it can be transported equally well by either the eastern or western route. If, as predicted, this 215,000 tons or more of concentrates per annum can be transported the 400 miles to either Waterways or Grimshaw for 1.6 cents per ton mile, the revenue accruing to the new portion of the railway would be some $1,321,000. per annum, which would increase as the production of concentrates from Pine Point increased.

The Pine Point lead-zinc ore deposits are in Devonian Limestones, and situated inland some sixteen miles from Dawson Landing, which was the temporary harbour giving access to the mine in the early proving-up stage. This ore occurrence has been known to prospectors since at least 1898 and claims have been staked and restaked several times since 1914. Some attempts were made to develop this discovery even before World War I.

Eventually exploration engineers of the Canadian Mining and Smelting Company carried on an extensive diamond

drilling program in 1948-49 and 1950, and succeeded in proving up an orebody some thirty miles long and said to contain at least 60,000,000 tons of lead-zinc ore of commercial grade.

Some work was done by other exploration companies to the west of the Pine Point orebody across the Buffalo River, but the results were not sufficiently encouraging. Due to the greater depth (the Pine Point ore plunges west) and the difficulties presented to the work by the very formidable swamps, no further investigation has been carried on. It has not been definitely established how much control has been exercized over the Pine Point deposit by the MacDonald Fault, but the existence of this very strong fault has guided the search for similar ore-bodies. The occurrence of lead-zinc at Sulphur Bay, and a geophysical survey outlining an anomaly lying between Boulogne Lake and Sulphur Bay, were responsible for the staking of approximately 1500 claims in that area. A limited amount of drilling was done, the results of which have not been made public.

The Slave River is the approximate contact between the older Precambrian rocks to the east and the younger Palaeozoic Sediments to the west. The Precambrian rocks on the east of the Slave River are part of the great Canadian Shield and it is in this Precambrian Shield that the great majority of our mineral resources have been found.

The Precambrian Shield area that would be most directly affected by a railway would be that area lying between Great Slave Lake and Lake Athabasca and east of the Slave River. This area was first mapped by the Geological Survey in the 1890's but the first prospecting rush came in 1935 with the discovery of gold on the north shore of Lake Athabasca. During 1935 the Geological Survey mapped extensively as far north as the Northwest Territories boundary and prospectors, exploration engineers and geologists spread over this interlake region as far as the south shore of Great Slave Lake. At least three shafts were sunk in the Goldfields area but none was successful in proving up a mine.

Exploration interests subsequently moved north of Great Slave Lake with the discovery of gold in that area, and the interlake region was more or less abandoned until the discovery of uranium at Beaverlodge Lake, close to the earlier Goldfields. This second prospecting boom in the area was more intensive and widespread than the previous one. All the former area was covered but the interest centered more in the Black Lake area at the eastern end of Lake Athabasca. In this latter region, iron, nickel and uranium deposits were discovered and exploration work was carried on until 1955 when again interest lapsed due to lack of progress in proving up commercial ore bodies. A lead-zinc occurrence at O'Connor

Lake was given a very thorough examination. A shaft was sunk and a second level opened up, but the ore did not prove to be present in sufficient quantity to warrant a base metal operation. Base metal ores such as lead-zinc, copper, nickel or iron ore must be present and delimited in large bodies to provide economic exploitation such that the ore can be mined at very low cost, and so as to provide large tonnages to a railway. Precious metal ore can be mined economically in smaller bodies, and such an operation does not depend to the same extent on either roads or railroads to provide economic exploitation. To sum up, apart from some possibility of large orebodies in the Black Lake area and a like possibility at the east end of Great Slave Lake, nothing other than scattered mineral occurrences have so far been discovered in this interlake area.

The region north of Great Slave Lake has proved itself by and large to be a "gold country" and no significant amounts of base metals have been uncovered apart from several encouraging copper and nickel deposits in the area east and north of Great Bear Lake. These regions are at present too far removed from existing ground transportation services to consider any form of transportation other than air or under-ice submarine freighter. A deposit of lead-zinc ore at Joe Indian Mountain is known to contain approximately 800,000 tons of ore, but tonnages such as these

would scarcely return the cost of the installations necessary for their recovery apart from the cost of concentrating and smelting the ore.

In the evidence presented to the Commission, great stress was laid on the numerous mineral occurrences found in the several areas adjacent to one or other of the proposed railway routes. The concensus amongst the eminent geologists and mining men appearing before the Commission, however, was that while these occurrences were of interest, they were not yet to be thought of as decisive in terms of commercial prospects, and that any predictions of commercial operations based on such mineral occurrences must be conditioned by a careful distinction between mineral showings and the presence of mineral deposits in sufficient quantity and concentration to justify a mining operation. All were careful to stress the wide range of probabilities separating these two types of occurrence. Yet all would agree that surface showings or occurrences of restricted extent in terrain of generally favourable structure invariably provide added incentive to more intensive exploration for deposits of commercial extent.

Evidence was submitted to the Commission in some detail covering metallic and non-metallic mineral resources associated with the more southerly regions adjacent to the proposed railroad routes e.g. iron ore deposits in the vicinity of present railhead at Hines Creek; the oil sands

gypsum and salt in the vicinity of Waterways; the gypsum beds at Peace Point some 225 miles north of Waterways; the rapid developing gas and oil prospects in the northwesterly section of the Peace River district. There is little question that all of these mineral prospects will develop substantial commercial value at some time in the future. But the immediate import of any one of these potential resource developments to railroad traffic is uncertain in every case.

The development of the natural gas and crude petroleum industries which must proceed over a wide-spread area in any event, is not highly dependent on the type of service which a railroad can offer. An exception to this statement is likely to take place in the event of extraction of crude petroleum from the Athabasca oil sands if methods are used which essentially involve mining the sands followed by extractive processing at a central and fixed location. Such an operation is likely to generate a considerable amount of inbound rail traffic by way of operating equipment and supplies. Yet at the present moment, it cannot be said that the technical and market obstacles facing commercial production have been definitely overcome. Moreover, as is true of the iron ore deposits in the Peace River district, any future development based on utilization of the oil sands either directly in thermal power generation

or by extraction and shipment of the oil can proceed now with only a short extension of rail beyond present facilities. The same can be said of the other non-metallic mineral deposits mentioned in the vicinity of Waterways e.g. salt, gypsum, sulphur by-product.

In the case of the extensive and high quality gypsum beds located at Peace Point on the lower Peace River, the presence of a rail extension could ordinarily prove critical to commercial production. Moreover, southbound shipments of the product would generate revenue over a considerable mileage on any northward extension of the railroad. There are, however, two serious reservations concerning early prospects for any development of the Peace Point gypsum deposits. In the first place, the deposits are located within the boundaries of the Wood Buffalo Park. Under present regulations relating to the administration of Canada's national parks, such a location is ruled out insofar as mining activity is concerned. The Commission was not and of course could not be given any definite assurance that such a restriction would be relaxed in the future. Secondly, from an analysis of the locations and freight rates applicable to existing sources of gypsum supply for the prairie market, and of a tentative freight rate quoted from Peace Point to Edmonton and to Calgary, it does not appear to this Commission that gypsum from Peace Point could be landed with

any significant competitive advantage anywhere but in Edmonton, where no plant exists at present.

With the advent of a railway, most if not all of these resources may be expected to call upon railway service at some time in the future, but immediate prospects are uncertain.

CHAPTER IX

HARBOURS

To complement the existing transportation network to the Canadian North to the best advantage, it is desirable that the railway should terminate at a harbour on Great Slave Lake, and preferably as close to the western end of this lake as possible. To clarify and justify this statement it may be that a short review of the past will enable us better to predict the future in this matter of water transportation and harbours.

The Canadian North is very fortunate in having several great water systems which have given access to a vast territory, and with the possible exception of the west side of the Mackenzie River valley, natives, traders, trappers, explorers and prospectors have been able to penetrate into almost every part of this region. Just how important good water routes are may be illustrated by the fact that Scotland was known to the Roman Legions at the beginning of the Christian Era, while the Hudson's Bay Company was incorporated only in 1670, yet more was known to the outside world of the present Northwest Territories than was known of the Highlands of Scotland in 1745.

In the early days of the fur trade the natives travelled the long and hazardous water route by the Churchill River to the trading factories on the Hudson's Bay. Later on the Hudson's Bay Company and more especially the North

West Company established trading posts inland as far as Lake Athabasca, and subsequently on Great Slave Lake and on down the Mackenzie. Trade goods to these posts still came from either Fort Churchill or Montreal and the boat brigades travelled from these points as far as the mouth of the Mackenzie River. The route was still the Churchill - Athabasca - Mackenzie River and the gateway to the North was Portage La Loche between the headwaters of the Churchill River system and the Athabasca - Mackenzie River system. Portage La Loche or Metheye Portage was in itself a very considerable obstacle to navigation, the portage was long and the height of land had to be surmounted, every pound of goods had to be back-packed over the height of land, both the incoming trade goods and the outgoing fur. Once on the Clearwater however, northward bound, there were only two more obstacles between the boat brigades and the Arctic Ocean, the portage at the Rapids of the Drowned at Fort Smith on the Slave River, some sixteen miles, which again meant loading and unloading, and beyond that the very dangerous south shore of Great Slave Lake had to be navigated, not laborious as is a portage, but involving long delays waiting for wind and weather to allow of passage from the mouth of the Slave to the headwaters of the Mackenzie, with then almost a thousand miles of unobstructed river travel lying ahead to the Arctic Ocean.

The first modification in this long established water route came with the arrival of the railway to Edmonton. It was found that the obstacles to transportation presented by the Churchill River and Portage La Loche could be economically by-passed by shipping goods by rail to Edmonton and thence by wagon road to Athabasca Landing on the Athabasca River. Athabasca Landing now became the gateway to the north, but the Cascades of the Athabasca still had to be navigated. With careful management however, there was not too much loading and unloading, and the route had tremendous advantages over the original Churchill River route.

It was clear to be seen of course that the next move to improve the water transportation to the north would be to have a rail head at Waterways on the Clearwater, and so by-pass the Cascades on the Athabasca River. This having taken place, of course brings us to our present water transportation system. The canoes and York boats have gone, as have the paddle steamers, and the goods now measured in thousands of tons instead of hundreds of bales are handled by barges and diesel tugs.

BELL ROCK HARBOUR

The things that have not changed, however, and indeed can only be circumvented, are the same two obstacles

that faced the old boat brigades, the Portage at Fort Smith and the shallow south shore of Great Slave Lake. Now, as advocated by the proponents of the eastern route, a rail head at Fort Smith would eliminate the portage between Fort Fitzgerald and Fort Smith and the present harbour of the Northern Transportation Company at Bell Rock would then become the head of navigation for the Mackenzie River - Great Slave system. This argument is sound and would seem to follow the pattern as herein outlined; however, in this case it seems that two birds can be killed with one stone. True it is that the portage at Fort Smith is the last portage and should be by-passed, but there is still left the navigation of the south shore of Great Slave Lake which, not presenting the hazard to lake boats that it did to canoes can still be hazardous and delaying, especially in the spring because of ice, and in the fall because of storms.

The south shore of Great Slave Lake, from the mouth of the Slave River to the outlet at the Mackenzie is, from a navigational standpoint, a most favourable shore. A deposit of sand and silt forms a shelf, more or less parallel to the shoreline and extending out therefrom for a distance of two miles. The shallow water covering this shelf, together with the fact that there are no sheltering promontories, makes navigation difficult with on-shore winds, and

during the spring break-up the lake ice is held against this shore preventing the movement of shipping from the mouth of the Slave River. In the late fall also, which is often a period of heavy northern gales, tugs with their tows of barges are often in difficulties, and as a result terminate their schedules as early as possible.

HAY RIVER HARBOUR *

It would be a desirable situation if there was a good harbour at the extreme west end of Great Slave Lake which could be used as a railway terminus. However, there is only one natural harbour on the south shore of Great Slave Lake, the harbour at Hay River, which is 97.2 miles west of the Slave River and only 28 miles from the outlet to the Mackenzie. Because of its more westerly location it is possible for shipping proceeding down the Mackenzie to leave Hay River in the spring a week earlier than can be done from the mouth of the Slave, and using Hay River as home port in the fall could extend the shipping season almost three weeks longer than if based at Bell Rock on the Slave River.

The already mentioned sand shelf along the south shore extends past the mouth of the Hay River and

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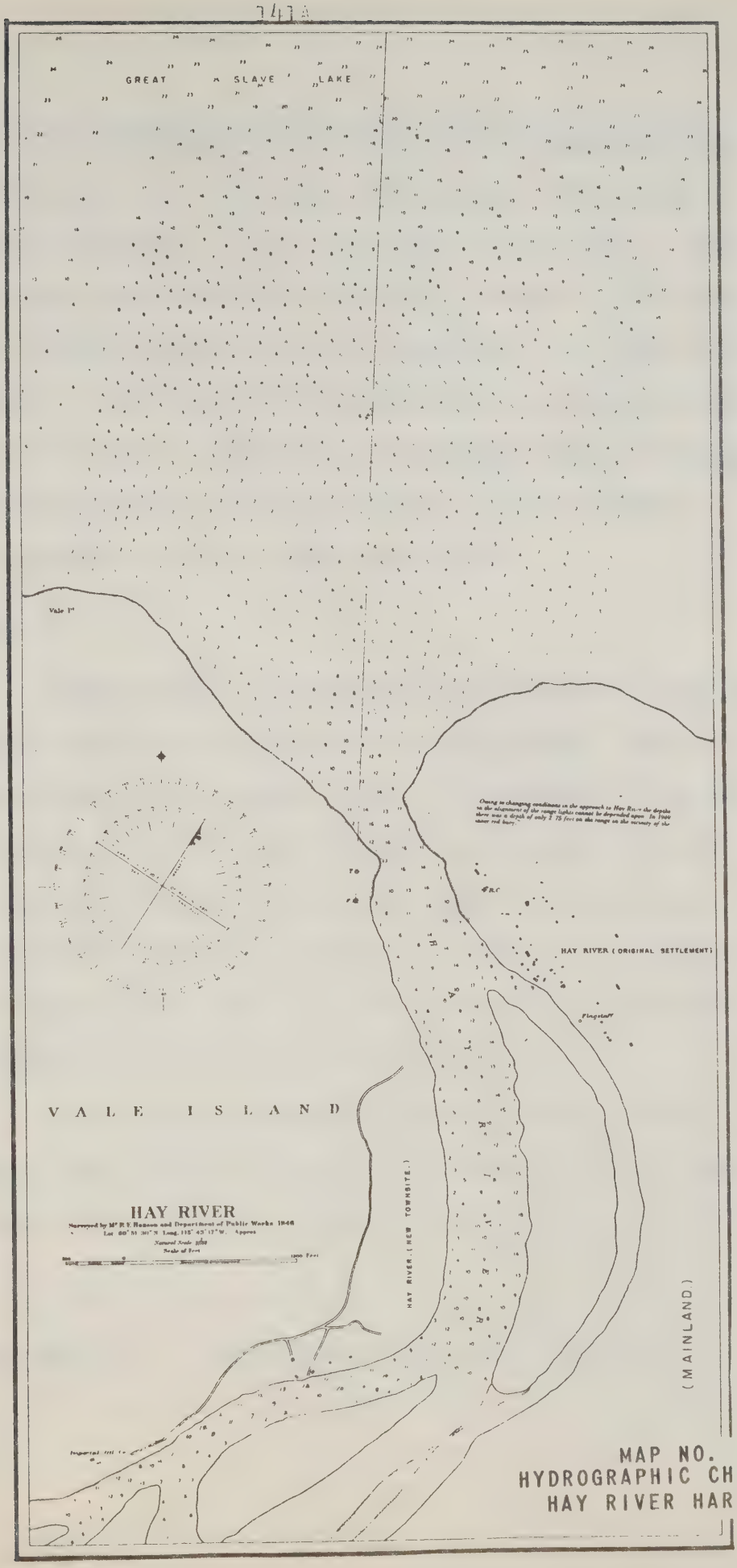
* See Map No. 1 - Hydrographic Chart of Hay River Harbour.



MAP NO. 1
HYDROGRAPHIC CHART OF
HAY RIVER HARBOUR

calls for fairly continuous dredging for approximately one and one-half miles out from the river mouth. The cost of this dredging amounts to about $25,000.00 per annum. The harbour at Hay River does not silt up, because it is lying in a river channel which has been dammed off, so that there is no current. The water is deep and there is approximately four miles at present available for wharfage and by moving the Mackenzie Highway crossing further up the channel, much more wharfage could be made available.

ILE DU MORT *

Considerable discussion arose as to the merits of a railway terminus and harbour at Ile du Mort, which is forty miles west of the mouth of the Slave River. The only apparent merit of Ile du Mort is that it is close to the lead-zinc ore deposits at Pine Point, should Pine Point require a harbour which is unlikely. There is no natural harbour at Ile du Mort and the cost of dredging and building break-waters would be very considerable.

Its location is even less favourable than the mouth of the Slave River; it would in no manner complement the existing transportation network; and its location makes

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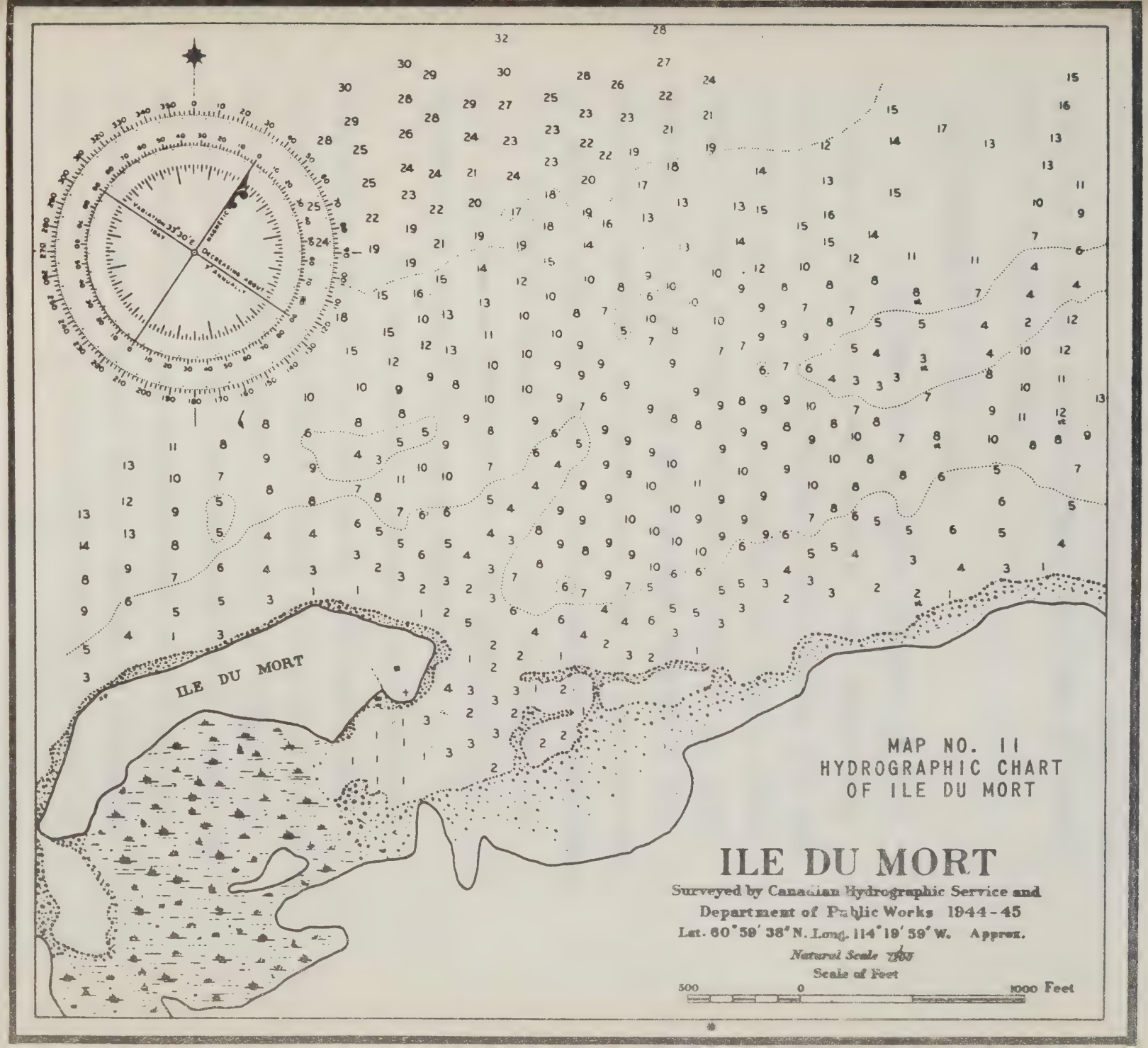
* See Map No. II - Hydrographic Chart of Ile Du Mort.


ILE DU MORT
MAP NO. 11
HYDROGRAPHIC CHART
OF ILE DU MORT
ILE DU MORT
Surveyed by Canadian Hydrographic Service and
Department of Public Works 1944-45
Lat. 60°59′38″N. Long. 114°19′59″W. Approx.
Natural Scale 1/600
Scale of Feet
500
0
1000 Feet

142A

it an undesirable cul-de-sac for present or future transportation to points north of Great Slave Lake or points down the Mackenzie Valley.

FORT PROVIDENCE OR MILLS LAKE

A harbour with a railway terminus at Fort Providence or at Mills Lake would be well located for future traffic down the Mackenzie River Valley, but such a harbour would be at a disadvantage for traffic southbound by barge to Great Slave Lake because of the swift current (10.7 m.p.h.) and the tortuous channel of the Providence Rapids. The added cost, too, of the 100 miles of extra construction and the cost of harbour installation would hardly be justified at this time and should wait until such time as the traffic on the Mackenzie is of such volume as to warrant this extra expenditure.

It would appear, therefore, that a railway terminus at Hay River is the logical location. There is already a well established community with harbour installations; the harbour itself is adequate and requires no maintenance. It is the focal point for truck, barge and air transportation, and the rates will be sufficiently competitive that shippers will be ensured of reasonable rates. It is also in a strategic position to serve the

area tributary to Great Slave Lake or the Mackenzie Valley and future contemplated extension of the railway, either west or north may be achieved with a minimum of cost consuming detours.

CHAPTER X

POPULATION

Population statistics were presented to the Commission by the protagonists of both routes as an argument in favour of the one route as against the other. Though 1956 Census figures have been used it is realized that the population in the areas served by both the eastern and western routes have been augmented since then, the western area possibly having a normal increase, while in the eastern area the population of Fort Smith may possibly have doubled since 1956 due to the establishment of much of the Northwest Territories administrative staff and to the building of a large federal school in that town.

Considering the population on that area served by a railway north from Waterways, (the eastern route) we have, along the Athabasca River to Fort Fitzgerald and centered mainly near the delta of the Athabasca and in the vicinity of Fort Chipeweyan, a population of 663, (1956 Census) while Fort Smith had a population of 1,100. In the area served by a railway north from Grimshaw and excluding any of the area north of the Territorial boundary,we have a population of approximately 8,000, roughly four to one in favour of the western route, if mere numbers are an argument in favour of any particular route.

An analysis of the occupational pursuits of the

people making up this population could be a determining factor. A population of 300 people at a base metal mine would create more traffic both inbound and outbound for a railway than would the same number engaged in a gold mining operation. The 663 people listed as residents of the eastern area along the Athabasca and Slave Rivers are occupationally engaged in work connected with river transport, fur-trading, trapping, fishing and lumbering, the last two only being traffic producing. The residents of Fort Smith are in the main engaged in administrative and clerical work, and apart from their household needs of heating and food supplies are non-traffic producers. In fact, in presenting their brief in favour of the eastern route, the Northern Alberta Railways advanced the argument in favour of this route that their branch line from Waterways to Edmonton had no back-haul from Waterways. The inference, therefore, would be that the 2,000 people along this route and also the people at Waterways and McMurray, are not primary producers, and nothing is processed or manufactured which would provide back-haul tonnage for a railway. The same brief also stated, and not without some basis for doing so, that if a railway went on the eastern route the water transportation on the Athabasca River would be discontinued. This was also the quoted opinion of the

Commissioner for the Northwest Territories. Now, if there is some basis for these statements that the water transportation would be discontinued, the net effect would be that the towns of Waterways and McMurray would virtually cease to exist and the population north along the Athabasca River would also decrease.

Turning again to the western route population, the 8,000 people resident in this area are largely engaged in agricultural pursuits with some lumbering and the private enterprises, (listed as 72 in number) that are necessary and ancillary to these. Now, while the rate structures are such that agricultural products and forestry products are not very profitable traffic to a railway, nevertheless very many branch lines were built with no traffic, or anticipated traffic in view other than agricultural and forestry traffic. These people are, however, primary producers and, as such, create some traffic both inbound and outbound for a railway and since the potential is considerable, an increase in population will result in a proportional increase in this traffic.

In the long term view, the greatest population increase can be looked for along this western route and down the Mackenzie Valley and this population will have a more direct service, either from or to the east via Edmonton or

from or to the west coast or world markets via the Northern Alberta and Pacific Great Eastern railways.

CHAPTER XI

ENGINEERING COST FACTORS

Costs of construction and operation applicable to the alternative rail routes will have some bearing - along with revenue considerations - on the profit or loss position arising from any new rail extension. This, in turn, will ultimately affect the rate burden to existing shippers or to the tax paying public at large. At the same time, evidence submitted to the Commission in connection with construction and operating costs was necessarily less complete than that covering most other aspects of the subject. This was so due to the high costs of conducting detailed locational ground surveys over a number of alternative routes, and the Commission therefore recognizes the tentative nature of any cost estimates submitted to it. At the same time, a number of general presumptions seem warranted with regard to some items influencing both capital and operating costs over the two proposed routes.

The engineering factors governing the cost of construction are as follows:

1. Route Mileage
2. Topography and Soil Conditions
3. Accessibility of route
4. Ballast
5. Bridges
6. Grades

1. ROUTE MILEAGE

The most useful and desirable northern terminus of the proposed rail line should be the harbour at Hay River for purposes of providing access to and developing the region tributary to Great Slave Lake. Such is the unanimous opinion of this Commission for reasons outlined elsewhere, and it is a view which is held quite regardless of whether the rail extension were to proceed from Waterways or from Grimshaw. On the basis of either route moving as far as Hay River with spur line connections to the Pine Point property estimated route mileages appear as follows:

Grimshaw to Alexandra Falls	362 Miles
Alexandra Falls to Hay River	36 Miles
Total - Grimshaw to Hay River	398 Miles
Alexandra Falls to Pine Point	75 Miles
Total - Grimshaw to Pine Point	437 Miles
Waterways to Fort Smith Jctn	290 Miles
Fort Smith Jctn to Pine Point Jctn	96 Miles
Pine Point Jctn to Hay River	40 Miles
Total - Waterways to Hay River	426 Miles
Pine Point Jctn to Pine Point	32 Miles
Total - Waterways to Pine Point	418 Miles
Fort Smith Jctn to Fort Smith	25 Miles

On the basis of these estimates where both Hay River and the eastern extremity of the Pine Point property are served by either an easterly or westerly route, there is no great difference with regard to sheer mileage of new constructions (437 miles via the West and 458 miles via the East, or 483 miles on the East including a spur to the Fort Smith area).

Mileages to Edmonton would appear as follows on the basis of the above estimates plus 327 miles from Grimshaw to Edmonton and 305 miles from Waterways to Edmonton.

Hay River to Edmonton, via Grimshaw	725 Miles
Pine Point to Edmonton, via Grimshaw	764 Miles
Hay River to Edmonton, via Waterways	731 Miles
Pine Point to Edmonton, via Waterways	723 Miles

Mileages applicable to northern freight moving through Hay River from or to Vancouver via the Northern Alberta - Canadian National or the Northern Alberta - Pacific Great Eastern railways would now stand as follows:

Hay River - Grimshaw - McLennan - Edmonton - Vancouver (N.A.R. - C.N.R.)	1490 Miles
Hay River - Grimshaw - McLennan - Dawson Creek - Vancouver (N.A.R. - P.G.E.)	1410 Miles
Hay River - Waterways - Edmonton - Vancouver (N.A.R. - C.N.R.)	1496 Miles

2. TOPOGRAPHY AND SOIL CONDITIONS

The Department of Highways, Province of Alberta, has actual data on file indicating the type of terrain to be traversed by a rail extension between Grimshaw and Hay River. This information has been accumulated as a result of surveys and later construction on the Mackenzie Highway. In general, the countryside is of low relief, in fact quite flat, but not to the point of presenting a serious drainage problem. Extensive cutting and filling can be expected to be at a minimum. Over the Alberta section of the Mackenzie Highway, the soil type is generally similar to that found to the south throughout most of the Peace River country - a type suitable for embankment and sub-grade purposes. North of the Alberta boundary from Alexandra Falls to Hay River, the route of the Mackenzie Highway follows ridges of coarse gravel for the most part. Less is known of the terrain which would be crossed by a branch from the vicinity of Alexandra Falls to Pine Point. There are indications that a route branching east near the existing winter road to Pine Point could travel reasonably well drained terrain on the escarpment and on gravel ridges beyond the escarpment.

In the case of an easterly route from Waterways to Hay River , not as much is known of the details of the terrain to be traversed. This is so owing to the lack of adequate ground surveys and of roads over most of the region.

Evidence obtained from a perusal of the note books of the Dominion Land Surveyors who ran the base lines and meridians over the region tributary to the Athabasca River indicates that most of this area is a sand hill country. The whole of the region is drained by streams flowing easterly towards the Athabasca River. Since the stream beds are in a youthful stage of erosion, the valleys are deep and V-shaped such as could require much bridging in their lower reaches.

The terrain west of Lac Clair is poorly drained with extensive swamps reaching west almost to Jackfish River Post. A railroad grade here would find it necessary to make a wide detour to the west to avoid these swamps. From Peace Point to the vicinity of Fort Smith, the country is flat with only minor marshy patches.

From the Fort Smith vicinity in a more or less direct line to the Pine Point headframe, as proposed by the railway companies, is to be found a most formidable expanse of swamp and muskeg - and one that has served extensively as a major resting ground for waterfowl. From such information as this Commission has been able to make available to itself, a preferred route would seem to run from the vicinity of Fort Smith northwesterly as far as possible along the top of the escarpment which eventually reaches the Hay River at Alexandra Falls. By dropping off the escarpment farther west than was proposed in the submission of the railway

companies, the worst of the marshy territory southeast of Pine Point can be avoided. The mining property can then be served by a short spur running off the line which continues north-westerly to Hay River. There seems little doubt but that the latter route would lead to lower construction and maintenance costs, although it is not such a direct route for the Pine Point property itself. On the other hand, such a spur would run almost the full length of the Pine Point property and so provide surface transportation to the mine.

With regard to soil types over an easterly route, these would seem to include a larger proportion of sands, tar sands and high organic content meadow soils than is the case to the west. None of these materials is very suitable for embankment and grading purposes and they are frequently costly to excavate and to maintain.

3. ACCESSIBILITY OF ROUTE

Accessibility for purposes of surveying and transporting men, materials and supplies for construction are important factors influencing the initial costs of construction of a railway. On the westerly route, the Mackenzie Highway would make any portion of a proposed railway line easy of access through the use of short access roads into the right of way. The grade can then be

constructed in sections simultaneously along its whole length. Delays developing in any one section need not be reflected in the progress of others.

Year-round accessibility by road to much of an easterly rail route is more difficult, especially along the west side of the Athabasca to Peace Point. This region is readily accessible by river barge during the summer months; however, accessibility at any time is difficult in the case of the marshy sections northwest of Fort Smith unless the route moved westward first along the top of the escarpment in the vicinity of the present winter road to Hay River. As matters stand at the present time and without further road construction, accessibility to an easterly right of way is at present confined to the summer months by barge or to the winter months by winter road. In general, ease of access for construction purposes is not nearly so convenient nor reliable along an easterly route as can be expected along a route north of Grimshaw.

4. BALLAST

Proximate supplies of gravel are understood to have been adequate for the construction of the Mackenzie Highway. Since railways will often prefer to train-haul their gravel for ballast, it may be necessary to have access to several large sources of gravel. The railway gravel pit in the valley at Peace River town still holds large reserves,

but due to the grade out of the valley, this may not always be a desirable source. However, the Commission is informed that there is a large gravel deposit just east of North Star, and an additional larger deposit on the west side of the Peace River, near Carcajou. North of Alexandra Falls to Hay River, the sub-soil itself consists mainly of a coarse gravel.

In the case of the eastern route, sufficient reconnaissance has not been made to establish the location or availability of suitable gravel reserves. Once over the encarpment south of Great Slave Lake on the northern end of the route, the terrain is again interspersed with old raised beaches and gravel ridges west and southwest of Pine Point.

5. BRIDGES

No major bridges are required over the western route with the exception of a crossing over the Hay River at some point. The only other valley of any consequence is that of the Third Battle or Meikle River, the Meikle River being a small stream with a youthful valley some 150 feet deep. The Notikewin, Keg, Boyer, Hay and Steen Rivers run in shallow valleys and are relatively narrow streams.

A railway following an easterly route must cross at some point two major rivers, the Athabasca and the Peace. If the Athabasca crossing is made at Fort McMurray in the valley, then the bridge span need traverse only the river

and not the full width of the river valley. While some have stated that no foundation problems are anticipated for a bridge site at McMurray, others have questioned this view. The same can be said of the bridge site at Peace Point on the Peace River. Little concrete information will be available on these points until some drilling has been undertaken on the sites to indicate the nature and depth of strata suitable for carrying foundations. In any event, both of these bridges must be long if not high, and will add materially to initial costs of construction.

If the proposed railway is routed along or close to the west bank of the Athabasca downstream from McMurray, a number of minor bridges will be required to span the narrow but deep ravines cut by the relatively small streams emptying into the Athabasca from the west. Beyond the Peace River little difficulty is likely to be encountered with bridging due to the lower gradients and hence river valleys of the streams in the area. Bridging of the Hay River will also be necessary at the terminus in order to connect with existing wharfage at Hay River town.

6. GRADES

On a westerly route, the present N.A.R. line from Edmonton Junction to Grimshaw (327 miles) is constructed to a ruling grade of 0.5% over its entire length

with the exception of an eight mile section of pusher grade ascending the west side of the Peace River valley between Peace River town and Grimshaw. This grade consists of a mixture of 1.9%, 2% and 2.2% grades against north-bound traffic. On the other side of the river valley, a similar pusher grade operating against south-bound traffic exists out of Peace River town. This is a grade of 2.4% for seven miles out of Peace River.

Such pusher grades in excess of the ruling grade for the line unquestionably give rise to operational disadvantages and costs. Either a pusher locomotive must be held in location to service trains on the adverse grade, or the train must be broken and relayed over the grade in sections. Either method of handling such isolated grades in excess of the ruling grade for the line is costly, but is only one element affecting the operating costs on the line as a whole. Even more important as a cost detriment is the degree of the ruling grade for the line, since this determines directly the weight of the train that can be hauled over the line as a whole by a driving unit of given power.

In 1917, a survey was carried out by the Central Canada Railway Company from the present locale of Grimshaw some seventy miles north to a point near the Meikle River.

This survey established that a ruling grade of 0.5% was entirely feasible to that point. Profiles of the Mackenzie Highway route filed with the Alberta Government Department of Highways indicate that a ruling grade of 0.5% could be obtained over the entire route from Grimshaw to Hay River in both directions. This would suggest the possibility therefore of obtaining a 0.5% ruling grade in both directions over the entire route from Edmonton to Hay River.

In the case of an easterly route, the existing line from Edmonton to Waterways is built to a ruling grade of 1% operating against both northbound and southbound traffic. It is axiomatic in railway construction that "when a ruling grade has been determined, all grades in either direction are cut down to that limit", and furthermore that "no added expense should be incurred to reduce grades below that pre-determined ruling grade". In the event of a railway extension beyond Waterways then, it is unlikely that such an extension would be constructed to anything less than a 1% ruling grade since this is the grade standard already present on the line between Edmonton and Waterways. In addition, there is a 2% pusher grade against southbound traffic south out of Waterways between Draper and Lynton.

Some idea of the influence of ruling grade on

costs of railroad operation can be had from the following statement. A railway having a ruling grade of 0.5% will permit hauling from 60% to 70% more tonnage per train with a given driving unit than is the case over a 1% ruling grade.* Stated differently, for a given tonnage and using the same class of locomotive, the railway with the 0.5% ruling grade would require, say, five trains to move the tonnage, whereas the railway with the 1% ruling grade would require eight trains to move the same tonnage.

SUMMARY OF ENGINEERING COST FACTORS

The evidence of Major J. L. Charles, Consulting Engineer and witness for the railway companies, indicated an initial cost of construction per mile of grade at about the same figure for either route when allowance is made for the initial cost of the two major bridges on an easterly route. It was emphasized that such estimates are based only on a preliminary reconnaissance of the two proposed routes, much of it from the air, and that such a reconnaissance certainly would not include any significant amount of ground survey work.

At the same time, it seems reasonable to this Commission that preliminary estimates of construction costs

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* Webb, Economics of Railroad Construction.

over an easterly route can hardly be accepted with the same degree of firmness as would apply to estimates over a westerly route. This is so in view of the large amount of information already available concerning ground conditions applicable to the construction of the Mackenzie Highway. The proposed routing of a westerly rail extension parallels closely the route of the existing highway. No such experience or information is available over much of an easterly route as proposed by the railroad companies. From what has already been said concerning soil, topographical and accessibility factors over the two routes, it is the view of this Commission that any upward revision of cost estimates based on final ground location surveys for either route is likely to be greater on the east than on the west. It is impossible to go beyond this general statement in the absence of more specific cost data.

CHAPTER XII

TRAFFIC FACTORS

Evidence was submitted to the Commission from several sources dealing with estimates of traffic likely to accrue to a rail extension following either a route north of Grimshaw or alternatively north of Waterways to a port on the south shore of Great Slave Lake. While some differences of opinion exist on small points pertaining to mileages and revenue generation per ton mile of traffic for a given freight mix, the broad outlines of an anticipated traffic pattern for either route can be developed with sufficient accuracy to serve the present purposes. These estimates are presented in Table V.

The figures reproduced in Table V are only suggestive of the rough order of magnitude likely to apply immediately to rail tonnages and revenues if and as a railroad comes into being along either route. Such a cautionary statement must be applied against the revenue estimates particularly, since each group of tonnages listed itself includes a mixture of products classified differently for railway rate-making purposes. Hence the implicit freight rates implied by the tonnage and revenue figures are really only a weighted average of the appropriate class and commodity rates thought likely to apply

TABLE 7

SUMMARY ESTIMATES OF TRAFFIC AND REVENUE INITIALLY AVAILABLE TO A RAIL CARRIER

TRAFFIC ITEM	via GRIMSHAW			via WATERWAYS		
A - AVAILABLE TO EITHER ROUTE	Tonnage	Revenue/ton-mile	Total Revenue	Tonnage	Revenue/ton-mile	Total Revenue
1. Lead and Zinc Concentrates Pine Point to Grimshaw or Waterways (assume 430 miles either way)	215,000	¢1.62	$1,502,000.	215,000	¢1.62	$1,502,000.
2. Mine Supplies Grimshaw or Waterways to Pine Point (assume 430 miles either way)	25,000	4.43	476,000.	25,000	4.43	476,000.
3. General Traffic Northbound to Great Slave Lake and Mackenzie River Points	70,000	3.56	1,094,372.	70,000	3.56	1,094,372.
B - WEST ROUTE ONLY						
4. Grain Southbound to Grimshaw (weighted average haul of 65 miles)	36,000	.50	12,000.			
5. Lumber Southbound to Grimshaw (weighted average haul of 125 miles)	12,000	.65	9,750.			
6. General Traffic Northbound from Grimshaw (average haul of 90 miles)	32,000	3.00	86,000.			

C - EAST ROUTE ONLY	via WATERWAYS		
	Tonnage	Revenue/ton-mile	Total Revenue
7. General Traffic Northbound, Waterways to Fort Smith Area (300 miles)	8,000	¢3.00	$ 72,000.
8. Lumber Southbound to Waterways (weighted average haul of 250 miles)	12,000	.65	19,500.
9. General Traffic Northbound for Lake Athabasca (Waterways to Peace Point - 225 miles)	100,000	2.50	562,500.

to the particular freight mix included in each broad category. These unit revenues or rates have been calculated on the basis only of mileages, rates and revenues applicable on through movements beyond either Grimshaw or Waterways as the case may be. While the figures presented are necessarily coarse estimates then, they are nevertheless useful as a starting point from which prognostications of future resource and development and therefore freight tonnages can be made. They are also indicative of the wide variations present as between groups of traffic with respect to the capacity of a given tonnage of each category to generate freight revenue to a rail carrier under the existing rate structure. The incremental revenue figures on traffic which is likely to move over the whole of the new line are based on the same total mileage between Grimshaw and Hay River as between Waterways and a terminal at Hay River.

Pine Point production southbound and Pine Point mining, general and petroleum supplies northbound are anticipated to yield over the beginning years of operation some 240,000 tons of traffic annually. The 25,000 tons of high rated general freight included in the above figure is expected to yield nearly $18. per ton as against nearly $7. per ton on the southbound bulk movement of

concentrates from the mine. The total of this traffic is expected to yield close to $2,000,000. annually to a rail extension, moving over either an easterly or westerly route, providing that the railroad can effectively compete for all the traffic against truck operations on the west which can move right into Pine Point, and barge operations on the east which cannot fully complete the movement to Pine Point even in the summer time.

In addition, it is estimated that some 70,000 tons of northbound freight annually can be anticipated for the general Great Slave Lake region and beyond (excluding Fort Smith) yielding an estimated annual rail revenue of just over $1,000,000. or about $15. per ton. This traffic is also potentially available to a rail carrier operating over either an easterly or westerly route.

Taken together then at some $3,000,000. annually, the two large Pine Point and Slave Lake traffic items constitute the major and potentially common core of traffic available to meet some portion or all of the out-of-pocket costs of operating and maintaining a northerly rail extension. In addition to these two large agglomerates of traffic, the assured prospects for other traffic assume relatively inconsequential proportions in terms of their immediate ability to generate revenue to meet the

costs of a new rail extension. The one exception to this statement, which has led to much controversy, involves an annual freight movement of some 100,000 tons of mining supplies and general freight moving into the Uranium City area on Lake Athabasca from Waterways by means of common (barge) carrier. Shipper's outlay for this movement is estimated to run in the neighborhood of $1,300,000. annually. More will be said of this item at a little later stage.

Some immediate prospects for a lumber movement accruing to a new rail extension are evident for both proposed routes. It appears that some 12,000 tons of sawn lumber could accrue immediately to a rail extension over roughly the first 200 miles north of Grimshaw. On the basis of the existing very favourable "Spokane" competitive rates plus arbitraries (rate increments beyond certain base points of origin) applying on lumber moving to eastern U. S. and Canadian markets, gross revenue accruing to the new line is likely to be in the neighborhood of $9,750.00 annually (assuming an average haul of 125 miles and a rate "arbitrary" beyond Grimshaw of .65¢ per ton mile). Thus lumber for eastern movement is a relatively low-rated commodity insofar as the new rail extension is concerned. On the route north of Waterways, immediate tonnage of sawn lumber

from existing licensed berths on mature and over-mature timber in the Wood Buffalo Park could also be said to be in the neighborhood of 12,000 tons annually, although mill capacity in the region is already twice this great. (Proponents of a westerly route argue that capacity north of Grimshaw could and would be doubled quickly with the advent of a rail extension). A given tonnage on an easterly route will tend to yield more freight revenue in the immediate future since the length of haul over the new line will be longer (225 miles from the vicinity of Peace Point and 300 miles from Fitzgerald to Waterways). The initial 12,000 tons of lumber on an easterly rail route could be expected to yield about $19,500. annually to the new line based on an average haul of 250 miles over the proposed extension (assuming a rate arbitrary of .65¢ per ton mile beyond Waterways). In any event, immediate revenue prospects of the above order are small on either route by comparison to the major groups of traffic already mentioned.

The same can be said of several other groups of traffic likely to be available only to a westerly or to an easterly route. It is estimated that grain loadings on a new rail extension north of Grimshaw might initially amount to some 36,000 tons annually. The bulk of this

production (about 85%) will be concentrated for some time in the Manning region some 55 miles north of Grimshaw, with most of the remainder coming to rail some 200 miles north of Grimshaw from the Fort Vermilion district. Assuming a weighted average haul of 65 miles for all grain shipments moving over a new line, and at the statutory (export) rate converted to a ton-mile basis for the area (.5¢ per ton mile), the 36,000 ton grain haul might be expected to yield just over $12,000. annually to a rail carrier. This amount also is comparatively insignificant from the point of view of revenue generated to sustain the operation of a rail extension. This is so not only because of the relatively low incremental rates applicable to grain shipments (as with lumber, but for different reasons) when compared to most other categories of traffic, but also because of the relatively short distance over which the bulk of the grain movement will take place on any new extension. Relatively little livestock can be expected to move over any new extension north of Grimshaw because of the already proven effectiveness of truck competition on the Mackenzie highway and south which can offer greater convenience and service to scattered shippers at nearly the same rates on all but carload rail shipments.

In the summary estimates of Table V one other item of northbound general traffic has been included for each of the two routes. This item is to include the general freight and supplies moving north from existing railhead at Grimshaw and Waterways and destined for intermediate points along the proposed new routes.

In the case of an easterly route, the extent of this traffic is easier to estimate since the bulk of it at present is destined for the Fort-Smith - Fort Fitzgerald region. Based on past barge shipments into the region over a number of years, a reasonable estimate for the Fort Smith traffic in the immediate future has been placed at 8,000 tons (of which nearly 5,000 tons consists of petroleum products). At a water competitive rate in the neighborhood of 3¢ per ton mile, this freight if carried by rail over some 300 miles from Waterways to Fort Smith would yield about $72,000. annually to a rail carrier.

In the case of a westerly route, the likely size of northbound general traffic for intermediate points is more difficult to estimate. According to 1956 Census information however, some 8,000 people are known to reside on farms and in settlements generally adjacent to the

Mackenzie Highway from Grimshaw north to High Level (approximately 180 miles) and east of this point into the Fort Vermilion region. It is assumed that the per capita requirement of inbound freight for family living and business use is about the same for the population resident along the west as for the population of the Fort Smith region (reported at about 2,000 in 1956). On this basis, the tonnage of northbound freight required to meet the needs of the population along a westerly route would be in the neighborhood of 32,000 tons annually. At the present time, all of this is moved by private or public truck carrier. If moved by rail however, this freight would move over an average haul of about 90 miles. At the relatively low (for general freight) average rate of 3¢ per ton mile, the 32,000 tons of freight would yield a revenue to the new line of about $2.70 per ton or $86,000. annually. This aggregate amount of revenue is not much greater than that estimated for the Fort Smith area traffic to the east even though the tonnage may be four times as great on the west. This is so due to the longer haul over any new rail extension to the east from Waterways to Fort Smith (300 miles) than from Grimshaw to intermediate points as far north as 180 miles. Once again, whether or not northbound general traffic between Grimshaw and Keg River

will ever become available to a rail carrier in significant amounts must remain an open question at this time. Suffice it to say that a railroad paralleling the Mackenzie highway, rebuilt to new standards, must compete with potential trucking operations capable of being offered under first class conditions.

On an easterly route, any new rail operation must also compete with the established barge service. As a water carrier however, such barge operations between Waterways and Fort Smith - Bell Rock have not been and can never be carried on under first class conditions such as to make available the usual low cost advantages of a water carrier. These matters will be dealt with later. Suffice it to say here that on most types of general traffic any proposed railway extension will find it more difficult to pick up traffic from present all weather truck carriers than from present seasonal barge carriers.

There remains now to consider some 100,000 tons of annual traffic presently moving by public barge carrier (Northern Transportation Company) from existing railhead at Waterways down the Athabasca River and across Lake Athabasca to Bushell, Sask., the port for the Uranium City area. The same water route is used by private barge carrier (Gunnar Mines) primarily for the movement of large

tonnages of bulk freight such as sulphur and petroleum products. Of the roughly 100,000 tons of freight moved by public carrier into the Uranium City area, it is estimated that about 40,000 tons consists of petroleum products, 25,000 consists of sulphur for process use in the uranium mills, the remaining 35,000 odd tons consisting mainly of mining supplies plus general freight. This total Lake Athabasca movement by public carrier beyond Waterways will yield at present barge rates some $1.3 million annually. It has been the subject of some controversy during the hearings before this Commission as to whether or not an extension of rail service beyond Waterways can expect to contribute in some way to the Lake Athabasca carriage.

In the traffic estimates of the joint submission of the Canadian National and Canadian Pacific Railway companies, the assumption was made that all of the public carrier barge freight at present moving into Lake Athabasca would instead move beyond Waterways by rail at least as far as Peace Point at the projected crossing of the Peace River, and some 225 miles north of Waterways. It was also assumed that some 35,000 tons annually of freight presently being barged and portaged from Waterways to Fitzgerald-Bell Rock

and beyond for Slave Lake points would also be carried by rail to a Slave Lake port such as Ile du Mort or Hay River. The same assumption was made for a Grimshaw route with regard to truck carriers operating over the Mackenzie highway.

It does not seem unreasonable to assume that traffic from Waterways destined to points north of Bell Rock harbor (at the foot of the Slave River portage) would continue to move competitively beyond Waterways by rail in preference to barge at least as far as Bell Rock harbor beyond the portage. This is so due to the influence of barging costs of a relatively short season of operation, or sporadic low water conditions, and of the necessity for railway-to-water trans-shipment at Waterways and again at Fort Fitzgerald for the portage (the latter estimated by Northern Transportation to cost in the neighborhood of $8.00 per ton). The combined influence of all of these items obviously provides a rail carrier considerable scope on which to compete with a northern river carrier. On the basis of existing water carrier rates from Waterways to Bell Rock and of railway company estimates of projected incremental rail rates beyond Waterways, it appears likely that a rail carrier could offer lower freight charges on traffic moving either way between Waterways and Slave Lake.

This would only happen in practice, however, as long as competing carriers are available to offer effective alternatives. At the same time it is to be noted that the present published barge rates of the Northern Transportation Company - a Crown Company - are high by usual water transport standards. This fact no doubt reflects in part certain of the unique operating conditions of the Mackenzie River system mentioned earlier, as well as a comfortable profit position. Faced with competition, there is little doubt but that the current barge rates applying on the Athabasca River system might well be reduced on the basis of the present volume of traffic.

Aside from traffic moving down the Athabasca River for points beyond the portage, and considering only the relatively large tonnage moving into Lake Athabasca, it is by no means clear that a rail carrier operating beyond Waterways to Peace Point will find it easy to interest shippers in any extended rail haul unless the rail rates quoted are unusually attractive for the type of freight involved. This is so since the extended rail haul must require trans-shipment to barge at Peace Point in any event, and will therefore not be able to offer year-round or otherwise improved service to the Uranium City area. Moreover, the barging distance from Peace

Point down the Peace and across Lake Athabasca to Bushell (Uranium City area) is only some 60 miles shorter than the existing water route from Waterways down the Athabasca and across Lake Athabasca to Bushell. This being so, it is unlikely that a water carrier will be able in the future to provide service to Lake Athabasca points from Peace Point at a cost plus profit per ton which is much lower than that now in existance on operations out of Waterways. On the other hand, if profits on the Peace Point barge operation are reduced so as to offer lower combined rates to shippers on operations out of Peace Point, then there is no reason why such mileage rate reductions cannot be made available on existing operations out of Waterways to nearly the same extent. It is true that draught conditions on the Peace River below Peace Point to the west end of Lake Athabasca are likely to be more favourable throughout most of the summer season. But there is also evidence to suggest that channel conditions over this stretch are so tortuous in at least one place as to require the relaying of barges - a slow and consequently costly operation. The annual capital charges arising from new harbour and trans-shipment facilities at Peace Point must also be considered in gauging the future cost structure of a water carrier operating out of Peace Point rather than Waterways.

All in all, there is little to indicate that water transport charges from Peace Point to Lake Athabasca points could be greatly reduced below those existing on operations out of Waterways, - and assuming a comparable profit or loss margin per ton on both operations. If this is so, then it would appear that a rail carrier operating north of Waterways to Peace Point would have little interest to shippers in the Lake Athabasca region unless the combined rail-barge charges via Peace Point were competitive with the straight barge charges on the alternative existing water route from Waterways via the Athabasca River. In view of the small difference in the length of the water haul on the alternative routes, this would imply that the incremental freight charges by the rail carrier on the combined rail-water route would have to be exceedingly low - perhaps in the neighborhood of 1-1/2¢/ton mile on general freight. This figure is considerably lower than anything projected in the revenue estimates contained in the joint C.N.R. - C. P. R. submission.

The estimate given above is arrived at in the following fashion. The Northern Transportation water-rate at present from Waterways to Bushell, Sask. is $20. per ton on general freight, which amounts to some 7.3¢ per ton mile over a distance of about 273 miles. Assuming for the moment

the same costs per mile on a water haul out of Peace Point, and a saving in water mileage of some 60 miles, then the total water charge on general merchandise out of Peace Point to Bushell might be reduced to the extent of some $4.40 per ton. For a rail carrier now to haul from Waterways to Peace Point, a rail distance of approximately 225 miles, at an incremental rate of $4.40 per ton beyond Waterways would imply a charge of $4.40 or 1.9¢ per ton mile on the freight mix destined for Lake Athabasca points. Railway company estimates were in the neighbourhood of 3-1/2¢ per ton mile. Conversely, if rail charges are assumed at 3-1/2¢ per ton mile or $7.85 per ton from Waterways to Peace Point, and the alternative straight water rate from Waterways to Bushell is $20. per ton, then a water carrier out of Peace Point would be left a margin of $20. - $7.85 or $12.15 per ton on which to carry freight from Peace Point to Bushell, a distance which is only some 60 miles or 23% less than the Waterways-Bushell water route on which the rate would be $20. per ton. Hence rail-water trans-shipment point at Peace Point rather than at Waterways to serve Lake Athabasca shows little prospect of adding revenue to a rail extension north of Waterways except either at the expense of the shipper, or at the expense of substantial revenue on the part of the water

carrier - which revenue would not have to be sacrificed if operations were to continue out of Waterways. If such revenue and profit reductions are justified on operations out of Peace Point, they will also be justified on operations out of Waterways.

In addition to the cost and revenue considerations bearing on the assumed rail-water haul into Lake Athabasca out of Peace Point, it is also to be noted that such an alternative operation will not necessarily provide shippers with more frequent or with year-round service. To do so would require the initiation of a winter truck or tractor haul from the vicinity of Peace Point or the Fort Fitzgerald region to the Uranium City area - an overland distance of between 150 to 200 miles. While such a service could easily develop at some time in the future, it is not necessarily assured by the advent of a railway in the general region. Nor is it assured that shippers would find it economical to use a winter rail-truck haul in preference to a summer water haul for anything but a limited amount of freight which is otherwise excessively inconvenient or costly to store.

On the basis of all the evidence therefore, it does not appear sound economically to assume that a projected rail carrier operating north of Waterways can

expect to obtain for some time to come more than a nominal amount of the Lake Athabasca freight haul although this nominal portion will ordinarily be high rated freight. Nor is it sound economics to manoeuvre or force the existing public water carrier into a changed and uneconomic operation so as to improve the revenue position of the new rail haul unless this is explicitly viewed as an operating subsidy to the rail carrier. Thus it would seem appropriate to subtract the Lake Athabasca freight of some 100,000 tons annually from traffic estimates submitted by proponents of the eastern route, and this adjustment will then be carried over to revenue estimates as well.

Viewing the traffic and revenue potential along each of the alternative rail route in general now, the immediate prospects can be summarized as follows. If all the traffic to Lake Athabasca points is excluded, the immediate volume of freight reasonably assured to either an easterly or westerly route is not very different. Somewhat higher tonnages are associated with the westerly route, but this is more than offset by somewhat higher revenues available to an easterly rail extension. This is so chiefly as a result of two factors, viz:

1. the smaller tonnage of traffic destined for the Fort Smith region consisting mainly of

general freight and petroleum products is consistently higher rated freight per ton mile than is applicable to a larger grain tonnage available to the west (about 1/2¢ per ton mile on grain moving for export as against probably 4-1/2¢ per ton mile or much higher on general freight depending on inter-carrier competition, but at least 3-1/2¢ per ton mile which is the barge rate currently in effect between Waterways and Fort Smith.)

2. both the lumber and Fort Smith traffic available to an esterly route will utilize a considerably longer section of any new rail extension north of Waterways than is true of the grain and lumber traffic available to any new extension north of Grimshaw. In other words, the smaller tonnage of traffic generated by intermediate points on an easterly route on the average is higher-rated and is hauled over longer distances on the new line than is the case of intermediate traffic generated on a westerly route.

But because these revenue differences are comparatively small in any event when judged against the totals, it is particularly important to realize that all estimates of traffic discussed so far are based on present or immediate tonnage availability and hence take little account of likely future growth trends with respect to different types of resource or industrial development. Nor do the summary remarks just recorded make any allowance for some part of the lucrative Lake Athabasca carriage that might accrue to a railroad particularly during the winter months if and when a winter road connection to Uranium City is built. These are all matters which are discussed elsewhere in this report.

A P P E N D I C E S

APPENDIX A.

C O M M I S S I O N

under Part I of the Inquiries Act

appointing Marshall E. Manning, Esquire, et al, Commissioners to inquire into the respective merits of alternative routes for a railway line from Northern Alberta to southern portion of the District of Mackenzie, N. W. T.

Dated . . . . . .22nd June, 1959

RECORDED. . . . . .22nd June, 1959

Film 84 Document 66

(Sgd. R. W. Doyle)

FOR REGISTRAR GENERAL OF CANADA

(Sgd. Vincent Massey)

C A N A D A

ELIZABETH THE SECOND, by the Grace of God of the United Kingdom, Canada and Her other Realms and Territories QUEEN, Head of the Commonwealth, Defender of the Faith.

(Sgd. W. R. Jackett)

Deputy Attorney General,

CANADA.

(S E A L)

TO ALL TO WHOM these presents shall come or whom the same may in any wise concern,

GREETING:

WHEREAS pursuant to the provisions of Part I of the Inquiries Act, chapter 154 of the Revised Statutes of Canada, 1952, His Excellency the Governor in Council, by Order P. C. 1959-705 of the fourth day of June, in the year of Our Lord one thousand nine hundred and fifty-nine, a copy of which is hereto annexed, has authorized the appointment of Our Commissioners therein and hereinafter named to inquire into and report upon the respective merits of the alternative routes that might be followed by a railway line to be built from northern Alberta into the southern portion of the District of Mackenzie, Northwest Territories, for the purpose of providing access to and contributing to the development of that portion of the Territories tributary to Great Slave Lake, and has conferred certain rights, powers and privileges upon Our said Commissioners as will by reference to the said Order more fully appear.

NOW KNOW YE that, by and with the advice of Our Privy Council for Canada, We do by these Presents nominate, constitute and appoint Marshall E. Manning, Esquire, of the City of Edmonton, in the Province of Alberta; W. D. Gainer, Esquire, of the City of Edmonton, in the Province of Alberta; and John Anderson-Thompson, Esquire, of Yellowknife, in the

Northwest Territories, to be Our Commissioners to conduct such inquiry.

TO HAVE, hold, exercise and enjoy the said office, place and trust unto the said Marshall E. Manning, W. D. Gainer and John Anderson-Thompson, together with the rights, powers, privileges and emoluments unto the said office, place and trust of right and by law appertaining during Our Pleasure.

AND WE DO hereby authorize Our said Commissioners to exercise all the powers conferred upon them by section 11 of the Inquiries Act.

AND WE DO hereby authorize Our said Commissioners to adopt such procedure and methods as they may from time to time deem expedient for the proper conduct of the inquiry and sit at such times and at such places in Canada as they may decide from time to time.

AND WE DO hereby authorize Our said Commissioners to engage the services of such counsel, staff and technical advisers as they may require at rates of remuneration and reimbursement to be approved by the Treasury Board.

AND WE DO hereby require and direct Our said Commissioners to report their findings to Our Governor in Council.

AND WE FURTHER appoint the said Marshall E. Manning to be Chairman of Our said Commissioners.

GIVEN under the Great Seal of Canada.

WITNESS: Our Right Trusty and Well-beloved Counsellor, Vincent Massey, Member of Our Order of the Companions of Honour, Governor General and Commander in Chief of Canada.

AT OUR GOVERNMENT HOUSE, in Our City of Ottawa, this twenty-second day of June in the year of Our Lord one thousand nine hundred and fifty-nine and in the eighth year of Our Reign.

BY COMMAND

(Sgd. C. STEIN)
UNDER SECRETARY OF STATE

P. C. 1959-705

Certified to be a true copy of a Minute of a Meeting of the Privy Council, approved by His Excellency the Governor General on the 4th June, 1959.

The Committee of the Privy Council, on the recommendation of the Right Honourable John George Diefenbaker the Prime Minister, advise that

Marshall E. Manning, Edmonton, Alberta

W. D. Gainer, Edmonton, Alberta

John Anderson-Thompson, Yellowknife, Northwest Territories

be appointed Commissioners under Part I of the Inquiries Act to inquire into and report upon the respective merits of the alternative routes which might be followed by a railway line to be built from northern Alberta into the southern portion of the District of Mackenzie, Northwest Territories, for the purpose of providing access to and contributing to the development of that portion of the Territories tributary to Great Slave Lake.

The Committee further advise:

1. That the Commissioners be authorized to exercise all the powers conferred upon them by section 11 of the Inquiries Act;

2. That the Commissioners adopt such procedure and methods as they may from time to time deem expedient for the proper conduct of the inquiry and sit at such times and at such places as they may decide from time to time;

3. That the Commissioners be authorized to engage the services of such counsel, staff and technical advisers as they may require at rates of remuneration and reimbursement approved by the Treasury Board;

4. That the Commissioners report to the Governor in Council with all reasonable despatch; and

5. That Marshall E. Manning be Chairman of the Commission.

"R. B. BRYCE",
Clerk of the Privy Council

APPENDIX B.

HEARINGS OF THE ROYAL COMMISSION

PLACE	DATES
Yellowknife, N. W. T.	September 2nd, 1959
Fort McMurray, Alberta.	September 4th, 1959
Peace River, Alberta.	September 8th and 9th, 1959
Edmonton, Alberta.	September 10th and 11th, 1959
	September 15th to 18th, 1959
	September 28th to 30th, 1959
	October 1st, 1959
	October 6th to 8th, 1959
	October 14th to 16th, 1959
	October 19th to 21st, 1959
	October 28th to 30th, 1959
	November 4th, 1959
	February 18th, 1960

APPENDIX C.

LIST OF SUBMISSIONS AND WITNESSES

SUBMISSION	WITNESS
Alberta & Northwest Chamber of Mines & Resources.	Cawker, E. A.
	Finland, G. H.
Alberta - Province of.	Taylor, Hon. Gordon E.
Anderson, C. H..	Baldwin, G. W., Q.C., M.P
Brintnell, W. L.	Brintnell, W. L.
British Columbia, - Province of.	Bonner, Hon, R. W.,Q.C.
	Foulks, Arthur
	Guest, J. I.
	Roethel, H. L.
	Southworth, J. J.
	Baldi, Mr.
	McNab, G.
	Collins, Mr.
British Columbia & Yukon Chamber of Mines	Riley, Dr. C.
Canadian Kodiak Refineries Ltd..	Moar, J.
	Gordon, A.
Dawson Creek, City of.	Forsyth, Mayor R.
Denney Logging Company Ltd..	Denney, R. B. Jr.

APPENDIX C.

Edmonton, City of, and Edmonton and Calgary Chambers of Commerce (Joint Brief).	Clement, C. W., Q.C.
	Bishop, E. E., Q. C.
	Grimble, L. G.
	Gordon, A.
	Edgar, N.
	MacDonald, B.
	Rueger, M. R.
Farmers' Union of Alberta.	Nelson, E. C.
	Harper, W. J.
Farmers' Union of Alberta, District #1. .	McIntosh, J. K.
	Powell, U.
Farmers' Union of Alberta, District #2. .	Iddins, E. F.
	Hibbard, H.
Farmers' Union of Alberta - Golden Meadow Local #215.	No Witness
Farmers' Union of Alberta - Local North Star #249, and affiliates Deadwood No. 206 and Notikewin-Hotchkiss #227 .	Jason, J.
	Lorenez, N.
	Fazikas, W.
Fort Smith Chamber of Commerce.	No Witness
Fort St.John & District Board of Trade. .	Murray, Mrs. M. L.

APPENDIX C.

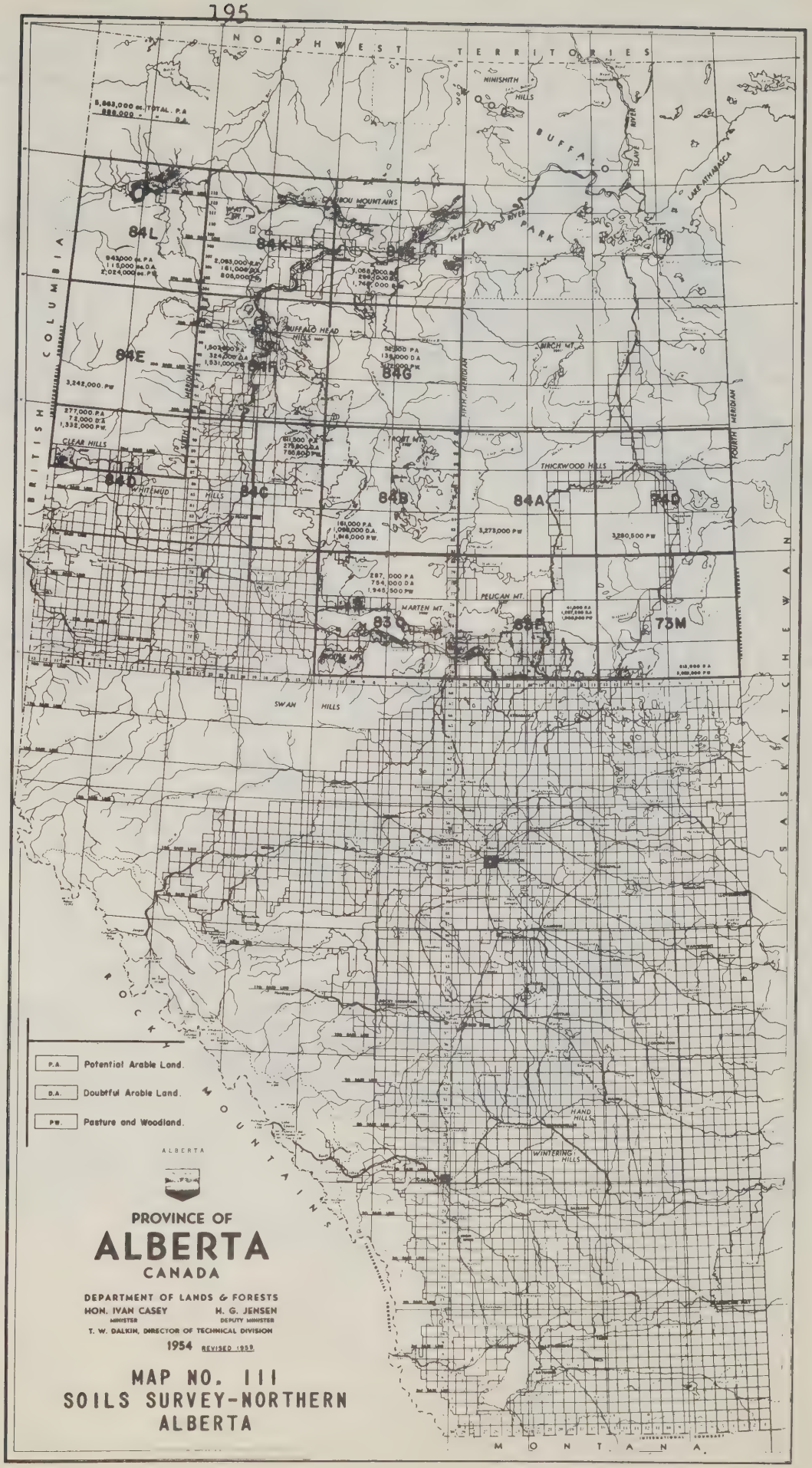
Grande Prairie Chamber of Commerce. . .	Baldwin, G.W., Q.C.,M.P.
	Rottacher, M.
Hay River Chamber of Commerce..	Porritt, R.
Horton, E. R.	Horton, Mayor, E.R.
Hotchkiss Ladies Club	No Witness
Jones, J. R..	Jones, J. R.
Lac La Biche Chamber of Commerce. . . .	Maccagno, M.
LeMouel, Jean M.	No Witness
McClarty, W. R.	McClarty, W. R.
McMurray Chamber of Commerce	Duncan, R. A.
	McDougall, M.
	Peden, Mr.
	Hill, W.
Northern Alberta Railways	Boyd, W. G.
	Levesque, D. J.
	Charles, Major J.L.
	Cooper, J. F.
	Rotstein, M.
North Vancouver Board of Trade	Frazer, M.M.
Northwest Territories, Commissioner of,	Brown, W. G.,Deputy Commissioner
	Jenness, Dr. J. L.
Notikewin-Hotchkiss F.W.U.A. Local #209..	No Witness

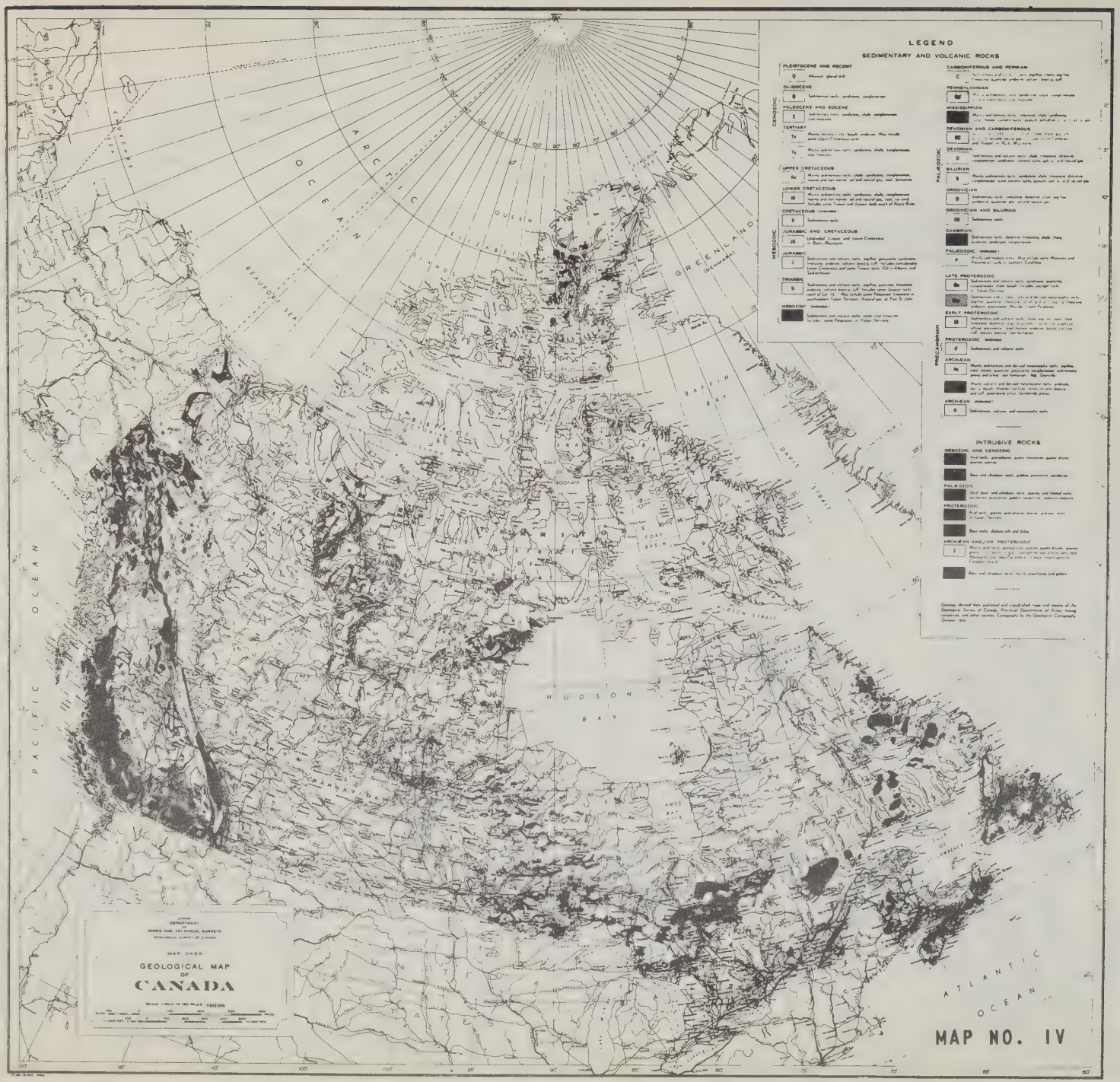
APPENDIX C.

Peace River Associated Chambers of Commerce	Baldwin, G. W. Q.C., M.P.
	Thomson, H.
	Bickell, J.
	Rottacher, M.
	Fischer, K.
Peace River Power Development Co. Ltd.	Shakespeare, J. S.
Pickard, M.	Pickard, M.
Pine Point Mines Limited	Frere, C.H.B., Q.C.
	Jewitt, W. G.
Porritt, Robert	Porritt, R.
Premier Steer Mills Limited	Heffernan, G.R.
Prest, B. J.	No Witness
Research Council of Alberta	Odynsky, W.
Royalite Oil Company Limited	Connell, G. A.
	Hay, C.
Sherritt Gordon Mines Limited	Pearce, R.
	Walford, R.
Sproule, Dr. J. C.	Sproule, Dr. J. C.
Swanson Lumber Company Limited	Hamilton, A. J.
	Matty, J. R.
United Grain Growers Limited	Edworthy, G.

APPENDIX C.

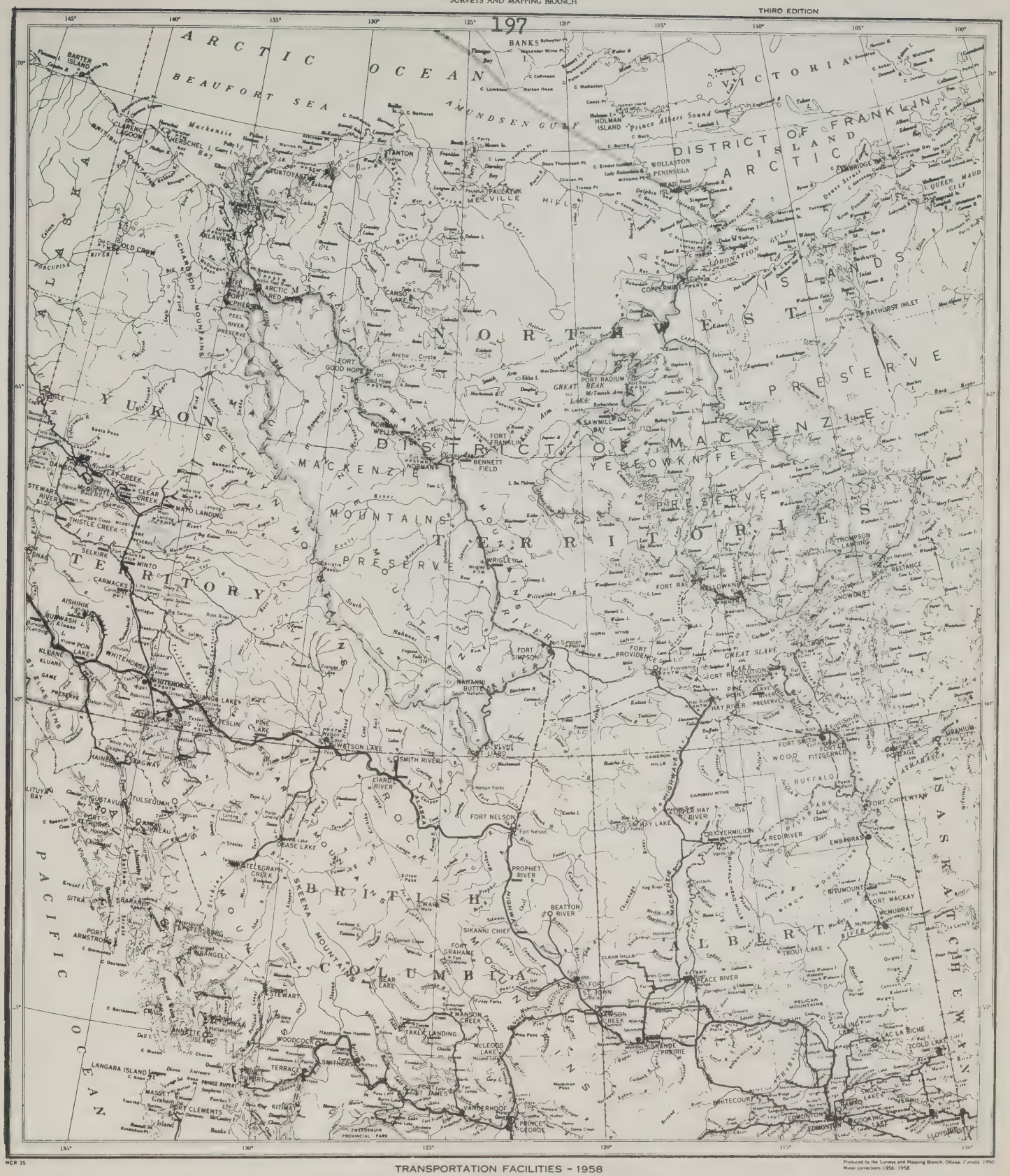
Uranium City Chamber of Commerce	Campbell, D. L.
	McMeekan, J. M.
Vancouver Board of Trade	Elmer, R. T.
Westcoast Transmission Company Limited .	Hume, Dr. E. S.
Yellowknife Board of Trade.	Bromley, G.
Rebuttal Brief - City of Edmonton and Edmonton & Calgary Chambers of Commerce	Bishop, E.E. Q. C.
Rebuttal Brief - Province of British Columbia . . .	Foulks, Arthur.


NORTHWEST TERRITORIES
BRITISH COLUMBIA
SASKATCHEWAN
MONTANA
ROCKY MOUNTAINS
BUFFALO PARK
LAKE ATHABASCA
SLAVE RIVER
NIMISMITH HILLS
CARIBOU MOUNTAINS
WATT MT.
BUFFALO HEAD HILLS
BIRCH MT.
CLEAR HILLS
WHITEMUD HILLS
TROUT MT.
THICKWOOD HILLS
MARTEN MT.
PELICAN MT.
SWAN HILLS
HAND HILLS
WINTERING HILLS
FOURTH MERIDIAN
FIFTH MERIDIAN
84L
84K
84E
84F
84G
84D
84C
84B
84A
84O
83
83F
73M
P.A. Potential Arable Land.
D.A. Doubtful Arable Land.
P.W. Pasture and Woodland.
ALBERTA
PROVINCE OF
ALBERTA
CANADA
DEPARTMENT OF LANDS & FORESTS
HON. IVAN CASEY
MINISTER
H. G. JENSEN
DEPUTY MINISTER
T. W. DALKIN, DIRECTOR OF TECHNICAL DIVISION
1954 REVISED 1959
MAP NO. III
SOILS SURVEY-NORTHERN
ALBERTA


LEGEND
SEDIMENTARY AND VOLCANIC ROCKS
CENOZOIC
PLEISTOCENE AND RECENT
OLIGOCENE
PALEOCENE AND EOCENE
TERTIARY
MESOZOIC
UPPER CRETACEOUS
LOWER CRETACEOUS
CRETACEOUS - undivided
JURASSIC AND CRETACEOUS
JURASSIC
TRIASSIC
MESOZOIC - undivided
PALAEOZOIC
CARBONIFEROUS AND PERMIAN
PENNSYLVANIAN
MISSISSIPPIAN
DEVONIAN AND CARBONIFEROUS
DEVONIAN
SILURIAN
ORDOVICIAN
ORDOVICIAN AND SILURIAN
CAMBRIAN
PALAEOZOIC - undivided
PRECAMBRIAN
LATE PROTEROZOIC
EARLY PROTEROZOIC
PROTEROZOIC - undivided
ARCHEAN
ARCHEAN - undivided
INTRUSIVE ROCKS
MESOZOIC AND CENOZOIC
PALAEOZOIC
PROTEROZOIC
ARCHEAN AND/OR PROTEROZOIC
Geology derived from published and unpublished maps and reports of the Geological Survey of Canada, Provincial Departments of Mines, mining companies and other sources. Cartography by the Geological Cartography Division 1954
MAP 0434
GEOLOGICAL MAP
OF
CANADA
DEPARTMENT
OF
MINES AND TECHNICAL SURVEYS
GEOLOGICAL SURVEY OF CANADA
PACIFIC OCEAN
ARCTIC OCEAN
ATLANTIC OCEAN
HUDSON BAY
BAFFIN BAY
GREENLAND
BEAUFORT SEA
MAP NO. IV

CANADA
MINES AND TECHNICAL SURVEYS
SURVEYS AND MAPPING BRANCH

THIRD EDITION



MCR 35

Produced by the Surveys and Mapping Branch, Ottawa, Canada 1950
Minor corrections 1956, 1958

TRANSPORTATION FACILITIES - 1958

NORTHWESTERN CANADA

REFERENCE
APPLYING TO NORTHWEST TERRITORIES

Royal Canadian Mounted Police detachment	P
Post office	P
School	S
Hospital	H
Nursing station	N
Trading post	T
Mission	M

REFERENCE

AIRPORT	●
AIRFIELD	○
LANDING STRIP (unlicensed)	▬
SEAPLANE ANCHORAGE (licensed)	⚓
SEAPLANE ANCHORAGE (unlicensed)	⚓
RADIO STATION	✦
RADIO RANGE	
MOTOR ROAD	═══
WINTER TRACTOR ROAD	— — — —
STEAMER ROUTE	- - - - - -

Scale: 50 miles to 1 inch

Miles 25 0 25 50 75 100 125 150 Miles

Datum = mean sea level

MAP NO. V

DISTANCES IN MILES BY AIR BETWEEN MAIN CENTRES ALONG PRINCIPAL FLYING ROUTES

Edmonton to Waterways	232	Grande Prairie to Fort St John	102
Waterways to Fort Smith	235	Fort St John to Fort Nelson	193
Fort Smith to Mills Lake	246	Fort Nelson to Watson Lake	236
Mills Lake to Fort Simpson	90	Watson Lake to Teslin	136
Fort Simpson to Wrigley	123	Teslin to Whitehorse	88
Wrigley to Norman Wells	174	Whitehorse to Aishihik	102
Norman Wells to Aklavik	302	Whitehorse to Dawson	266
Fort Smith to Yellowknife	[illegible]	Whitehorse to Juneau (Alaska)	164
Yellowknife to Port Radium	271	Edmonton to Prince George	375
Port Radium to Coppermine	143	Prince George to Smithers	192
Edmonton to Grande Prairie	264	Smithers to Annette Island (Alaska	175

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OTTAWA, 1960

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